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ABSTRACT

Based on experience in the field, this training program was developed to help Peace Corps trainers teach appropriate community technology to Peace Corps volunteers and community workers. The 8-week, 104-session training program is organized in six phases that cover the following topics: introduction to training; earthen construction and fuel-saving cookstoves; pedal/treadle power; solar water heaters; solar agricultural dryers; and concluding the program--the energy fair. Each of the technical and nontechnical areas is related to the other components of the program. Health and nutrition and the role of the volunteer in development are stressed throughout the program. Nonformal education and cross-cultural education are the integrating principles of the program. Each session outline contains total time, objectives, resources, trainer notes, procedures, and handouts as needed. Appendixes list skills for development facilitators, outline two-week workshops, and provide 14 pages of bibliographies. (KC)

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TRAINING FOR DEVELOPMENT

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Appropriate Community Technology

A Training Manual

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TRAINING MANUAL NO. T-28

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A TRAINING MANUAL
IN
APPROPRIATE COMMUNITY TECHNOLOGY:
An Integrated Approach for Training Development Facilitators

by

The Farallones Institute Rural Center and CHP International, Inc.

in collaboration with

The Peace Corps Energy Project/OPTC

Contract # 81-042-1012

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The Farallones Institute Rural Center

The Farallones Institute is a non-profit organization active in the development of appropriate community technologies, with an emphasis on renewable sources of energy and food systems. Areas of expertise include:

- Design and implementation of training programs, with a focus on experiential learning and the acquisition of integrated skills
- Development of educational materials
- Resource gathering and information sharing
- Design, use and evaluation of small-scale technologies
- Study trips to rural China
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CHP INTERNATIONAL, INC.

CHP International, Inc. is a consulting firm specializing in the design, management and evaluation of international training programs. It develops and conducts technical, cross-cultural and language programs in Latin America, Asia and Africa. In addition, CHP International, Inc. leads staff development workshops in the techniques necessary to effectively implement competency based and experiential training programs.

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PREFACE

This training manual represents more than two years of involvement with the Peace Corps Energy Project. The manual was begun in October 1979 as one component of a pilot training program undertaken by the Farallones Institute and CHP International, Inc., and has been completed in accordance with the terms of a second contract.

During that time, we have written a preliminary draft, a revision of those materials, and the current training manual. In addition, we have conducted four training cycles at the Farallones Institute Rural Center, based in large part upon the content of this manual.

We believe that our involvement has produced a valuable and adaptable learning tool. However, the manual must continue to be tested, evaluated and modified in order to reflect changing needs and circumstances. It is our hope that you will contribute to that process, and that you will help make the manual more appropriate and useful during future training programs.

If you have observations or suggestions about the contents, methods or approach included in the manual, please contact the authors at the Farallones Institute or CHP International, Inc.

ACKNOWLEDGMENTS

> Appropriate technology reminds us that before we choose our tools and techniques, we must choose our dreams and values, for some technologies serve them, while others make them unobtainable.
>
> Tom Bender, in Rainbook

There have been many valuable sources of support during the development of the program and training materials. It is only with the help of many people that we have been able to document the various tools and techniques that we have chosen to use in training people to go gently and lightly into the lives of others.

We owe a great deal of gratitude to the people of Peace Corps/Washington for locating resources and lending sustained support to our efforts throughout the project. Our thanks go to past and present staff of the Peace Corps Energy Project, the Office of Training and Programming Coordination (OPTC), Information Collection and Exchange (ICE), and the ACTION Library.

We are also grateful to the people of the Aprovecho Institute; their substantial contribution to the design, development and testing of the cookstove component has been invaluable.

In addition, our thanks go to the people of the Appropriate Technology Project/Volunteers in Asia, and to the staff of the Hesperian Foundation for their continued help and inspiration. Although we cannot mention tham all by name, we also thank the many kind people who have contributed by giving us permission to use materials they have developed.

Special thanks are extended to the members of the Farallones community for their continued support, endurance and patience during the evolution of this project.

Finally, perhaps our most important acknowledgment should go to the Peace Corps trainees who have come to learn and, in turn, to teach. It is with them that we have shared our dreams and values. We hope that the tools and techniques they have chosen will serve the world kindly and well.

INTRODUCTION

Basic to the purpose of this program is the belief that appropriate community technology represents as much a process as a philosophy. The process begins when people take an active role in their own education; it continues as they identify not only their needs, but also the resources, abilities and methods that will help them make decisions and address their problems in ways that are both sustainable and locally appropriate.

The philosophy of appropriate community technology reaffirms what most of the world's villagers know inherently -- that culture, social systems, politics, religion, economics and ecology are all threads in the same fabric of community life; and that technology exists only as a tool, a loom upon which all the other threads are woven.

The first role of the community facilitator is to respect and understand the intricacy and interdependence of the factors that define a community. Only then is it appropriate to assist and encourage people to utilize their talents, apply their creativity, and recognize options for change. As the process continues, the facilitator -- in this case, a Peace Corps Volunteer -- works with the community, learning from and building upon traditions and indigenous technologies that have evolved in response to local values, needs and conditions. Appropriate change must happen slowly, carefully, and from within; it should not be the result of outside imposition, regardless of good intentions.

An important part of this program is the recognition that technical expertise is significant and useful only when it is applied in balance with other qualities. It is of little importance for a person to be technically competent without the ability to work in cooperation with others, and help motivate them towards a more self-reliant and healthy life. For this reason, it is essential that future Peace Corps Volunteers develop a variety of complementary skills, knowledge and attitudes that will serve to weave together the many threads of appropriate community technology. This training program is committed to, and based upon, that process and philosophy.

DESIGN AND CONTENT OF THE PROGRAM

The training program is a model for future community work, and therefore emphasizes the parallels that exist between training and Peace Corps service. Throughout the eight weeks of the program, participants are encouraged to take a full and active role in their own education, and to make decisions that will affect them and the people with whom they work and live. They are urged to cooperate with others to identify and use the talents and resources that are available in the group, and to practice skills that help motivate people, instill within them a sense of self-confidence, and involve them in the process of their own education. In addition, the training program provides an opportunity for participants to examine their values, and to look carefully at the issues that will shape their role as community facilitators.

The approach to training is based on the principles of non-formal education, and is designed to strike a balance between structured learning and guided, yet independent discovery. The sessions, resources and methods that are included reflect the belief that adults are capable of self-direction and creativity when encouraged to apply their knowledge and skills in ways that are relevant to their lives. It is the intent of the program to offer a framework to future Volunteers, so that they may apply what they have learned in training to their service in the Peace Corps.

Program Components

Each of the technical and non-technical areas is related to and integrated with the other components of the program. This design highlights the connection and interdependence between technology and other aspects of development, and provides important parallels to community work. The training components are:

* Earthen Construction and Fuel-Saving Cookstoves
* Pedal/Treadle Power
* Solar Water Heaters
* Solar Agricultural Dryers
* Health and Nutrition
* The Role of the Volunteer in Development

The Technical Areas: Cookstoves, Pedal/Treadle Power, Solar Applications

The program offers skills training in all stages of technological development: the design, construction, operation, maintenance, repair and evaluation of small-scale prototypes and devices. The designs are selected to be as consistent as possible with the realities of rural areas in most of the world, and are based on the following criteria:

* Affordable, and low in capital investment
* Simple and adaptable in both design and scale
* Easily understood by people with little or no formal education
* Responsive to local needs and abilities
* Able to be constructed, operated, maintained, repaired and managed by the users
* Based on the use of renewable sources of energy and local resources, both human and physical
* Characterized by the potential to contribute to local cooperation, self-reliance and good health

During the technical sessions, people are encouraged to modify, adjust or adapt the technologies to meet the requirements of Peace Corps assignments. Participants are urged to concentrate on the process of applying new information and skills in ways that extend beyond the specific designs or techniques used in the program.

Health and Nutrition

This component includes a variety of topics that appear in specific health and nutrition sessions, as well as in each of the other program areas. The material covers:

- Regional and global health issues
- Cross-cultural perspectives on health traditions and systems
- Personal health maintenance and first aid
- Basic nutrition
- Maternal and child health
- The application of locally appropriate technologies to promote, maintain, restore and improve the health of the community.

The Role of the Volunteer in Development

The sessions and activities in this component provide a framework and a context for the skills and knowledge gained in the other areas of the program. The materials have been designed to stimulate thought, and to guide people as they articulate their philosophy about appropriate community technology and the role they will take during Peace Corps service. Throughout the component, participants are asked to look at their own cultural perceptions, and clarify their values. They analyze the implications of technological change, and examine the importance of including, in the entire development process, all who will be affected by such change. It is in this component that people learn and begin to apply the principles and techniques of non-formal education and adult learning. Through discussion, reading, role-play and a variety of other activities, people are encouraged to develop and practice the skills that will enable them to be effective and sensitive community facilitators.

Program Themes

A number of related and fundamental themes appear throughout the program; these guide the development of the skills and qualities that will be necessary during Peace Corps service. The themes are introduced in the first week of training, and serve as a foundation upon which the rest of the program is built. Together, the themes illustrate the integrated nature of community work, as well as the parallels that are found in this training program.

In each area and phase of training, there is a focus on:

- Principles and techniques of non-formal education and adult learning
- Methods and approaches to solving problems
- Development issues
- Cross-cultural perspectives
- Health maintenance and promotion
- The process of assessment and evaluation

Program Phases

The training program is divided into six structured blocks of time, termed "Phases." The first and last serve to introduce and conclude the program; each of the others is organized around a specific technical area, which is integrated with relevant information and activities from the other program components. Some sessions in each phase are designed to help people acquire, practice and apply technical and facilitation skills; others are included as core sessions, and complement the technical material with background information and added perspective. Within each phase, the sessions are presented in an order that helps people build upon previous knowledge, and apply what they have already learned about both technical and non-technical areas of community work. Following are descriptions of each phase.

Phase I: Introduction to Training

The initial phase includes an overview of the content and themes that comprise the program. Here, the learning approach used in training is presented, and the principles of non-formal education are introduced. There is an emphasis on identifying the parallels that exist between training and future Volunteer service: Participants identify and examine the skills and qualities they will need in order to be sensitive and useful in community work, then begin to practice effective communication and facilitation skills.

Phase II: Earthen Construction and Fuel-Saving Cookstoves

In this phase, there is a focus on both acquiring technical skills, and understanding the issues and considerations that influence the development of cookstove programs. The sessions in design, construction and application are integrated with related material in health, sanitation and the environment, communication skills, cross-cultural perspectives, and the effects of technological change on traditional societies.

Phase III: Pedal/Treadle Power

The major technical themes are the design, construction, use and potential applications of devices that use the principles of power transfer. These include mobile and stationary dynapods and other human-powered machines. Related studies include: maternal and child Health, a view of community health and appropriate technologies, communication skills, and issues in international development. In addition, a mid-program evaluation takes place at the end of the phase.

Phase IV: Solar Water Heaters

In conjunction with the design, construction and use of solar prototypes and devices, there is an emphasis on the importance of needs and resource assessment, and communication and facilitation skills. As part of the health component, first aid training is included in this phase.

Phase V: Solar Agricultural Dryers

In both the technical and non-technical sessions, there is material included on food preservation and storage, issues of agriculture and land use, and possible methods of improving the health and nutrition status of a community through the use of locally appropriate technologies.

Phase VI: Concluding the Program: The Energy Fair

As training draws to a close, the program themes are gathered and used as a basis for a final project. The participants plan and hold a community-wide energy fair to interest and educate people, and to demonstrate what has been learned during the program. In this phase, people have the opportunity to apply their facilitation and communication skills, and to use their talents and creativity to plan and carry out a major project. There is a focus on all aspects of project development and the evaluation process. In addition, the final phase serves as a transition to Peace Corps service, and to future work in appropriate community technology.

Skills for Development Facilitators

As an outline and a summary of the knowledge, skills and qualities that are important for effective community work, the Skills for Development Facilitators have been compiled for use in this program (See Appendix A). The skills follow each stage and aspect of the facilitator's involvement, and include:

* Taking preparatory steps
* Establishing a dialogue
* Planning with the community
* Using the dialogue approach to carry out projects
* Evaluating the process

The Skills for Development Facilitators represent more than linear steps in the development of appropriate community technologies. They are part of a continuing process of building local self-reliance and capabilities. Each component of the program is designed so that all skill areas are emphasized throughout the phases of training. There is a balance of skill areas included in each phase. These skills are indicated in both the phase calendars and the individual sessions. It is intended that the skills be developed and practiced during the entire program, so that by the end of training people have had the opportunity to move through each stage in the process of community involvement.

NOTES TO THE TRAINING STAFF

This manual is intended as a resource to help plan, prepare for and conduct a program that is responsive to a variety of training situations. It is probable that you will use the manual in one of two ways: either in its entirety -- as developed, tested and evaluated, or in sections, when there is a need to focus on one or more of the technical components.

We encourage you to modify and adapt the materials to make them more useful. However, when making any changes, it is important to do so with care, in order to maintain the integrated nature of the program. It is essential to the effectiveness of training to provide a balance in the various skill areas, and to help people build upon and apply new knowledge in a way that is ordered and logical. Please read and follow the general guidelines that have been prepared to help you transform these training materials into a dynamic, appropriate tool for learning.

Some First Steps: Planning and Preparation

There are many steps that occur before training actually begins: defining the program, locating a site, identifying participants and staff, gathering resources and materials, and performing a host of other logistical and preparatory tasks that sometimes appear endless, but that must be done before the program can happen. We include here some perspective to help you get started:

* What is the scope and content of your program?
  If it is an eight-week appropriate community technology training cycle, then it is probable that very little will change. However, if it is a shorter program, such as one that will be used for in-service training or other workshops, you may follow the calendars designed for that purpose (See Appendix B: Two-Week Workshops). Even if you will be using only one part of this manual, please read through all the guidelines, and note the design and format of the program.

* Where will training occur?
  It is best to choose a site that is conducive to experiential learning. It should include adequate room for people to build the technical devices, work in small groups, and if possible, be outdoors during much of the program. There should be a classroom or meeting facilities at the site, and a reference library where there is a quiet environment for reading and study. Although not essential, it is useful for training to be held in or near a community. Such proximity offers participants the opportunity to gain valuable field experience in assessing needs, working with people to solve problems, and practicing communication and facilitation skills. In addition, there are often many resources available in an established community: schools, libraries, health centers, as well as local organizations, businesses, cooperatives and small industries.

- Who will participate?
It is likely that the people who enter the program will represent a variety of backgrounds, abilities and outlooks. Use this diversity as a tool to promote learning among participants with sometimes very different levels of technical expertise, education and experience. It is a challenge that is worth the effort of all involved.

During this program, it is expected that a person who has basic practical skills and a desire to learn will have the opportunity to develop sufficient skills, knowledge and attitudes to serve as an effective and sensitive Peace Corps Volunteer. Before training begins, it is helpful to assess the participants' skill levels to get a sense of the experience and knowledge that each person brings to the program. It is also valuable to find out as much as possible about specific Peace Corps assignments, so that people can direct their education to meet future job requirements.

- What are the staff considerations?
It is important that the entire training staff be familiar with the principles and techniques of non-formal education and adult learning, and that they be comfortable with the educational approach and style of the program. The staff should be flexible, and able to "let go" so that the participants are encouraged to take an active role in their education. When there is faith in the training group, they will respond with a high level of motivation, learning and responsibility. These benefits are well worth any "loss of control" involved.

Staff members should represent a balance of backgrounds and skills, and be able to complement one another's expertise. Each person should have practical skills in one area, an understanding of related issues, and a knowledge of the literature and resources in that field. It is helpful if the staff includes people who have lived and worked overseas, especially in the area of appropriate community technology. We suggest that the staff consist of at least one person in each of the following areas: the technologies (Fuel-Saving Cookstoves, Pedal/Treadle Power, Solar Water Heaters and Solar Agricultural Dryers); health and nutrition; development issues, including perspective on women's roles in the development process; and non-formal education and adult learning.

Although the number of staff will vary with individual programs, it is best if there is at least one staff member for each five participants. This ratio ensures individual attention in all aspects of the program, and helps dispel the "we/they" dichotomy that sometimes exists between staff and participants.

A staff training workshop should be scheduled before the program begins. This gives the staff an opportunity to build training skills, as well as to establish the cohesiveness necessary to function as a cooperative and effective team. The person who conducts staff training should be qualified and experienced in the educational approach used in the program, and have expertise in management training techniques. All staff members should participate in the workshop; it is crucial to the success of the program and should not be omitted.

If outside consultants are to be included in the program, consider and select them with care. It is important not to lose the focus of the program by including too many people who may not be familiar with the philosophy, methodology or details of training. However, we do recommend that local resource people be invited to participate in parts of the program, and that consultants be asked to lend perspective and provide additional information. Some suggested consultants include: community workers, appropriate technology practitioners, health and nutrition workers, artisans, farmers, and people who have lived and worked in other countries.

* What resources and materials will be needed?
For the most part, these will be defined by what is available and appropriate for the training situation. Although very little is essential, we recommend that you follow the resources listed in each session. Use the bibliography as a guide. Each of the entries is coded as to its use and relative importance in the program. (See Appendix C.) Some of the texts are available from Peace Corps, and others must be purchased. Order books, films, slides and any other resource material with time to spare. As much as possible, anticipate training needs so that the materials will be available when they are needed.

Be certain that there are enough tools, supplies and other materials before the program begins. If the suggested items are not available, substitute with something comparable. Use your ingenuity, and you will find that the participants will follow your lead.

If there is not an established reference library at the training site, organize one based on the recommended readings in the bibliography. Include material about the countries in which the participants will serve, and add any other relevant resources. Try to keep the library current so that the resources meet the needs of the people who use them. The care and maintenance of the library may be a responsibility of the training participants once the program is underway.

Note that some of the recommended resources are protected by copyright, and that permission must be obtained before reproducing them for general use.

Remember that resources are usually helpful, but seldom essential. There is as much importance in finding a way to do without something that was considered absolutely necessary as there is in using it for its intended purpose.

- What kind of technical preparation is necessary?

  In addition to gathering the tools and supplies, and locating adequate workspace, there is another preparation to be completed. The technical staff should think about the devices and materials to be used in the program, and determine if they are suitable for training purposes, as well as for in-country application. If the technical trainers have not already done so, they should build the prototypes and devices in order to gain added perspective on design considerations, construction techniques, time requirements, potential applications and possible problems. Such devices and prototypes may be used as demonstration models during the program.

- How will training be conducted?

  The program may follow the manual design, so that all participants go through the phases at the same time. Although, if the group is larger than nine or ten people, another option may be pursued: that is, Phases II and III, IV and V may be scheduled concurrently. Half the participants learn the technical aspects of one phase, while half of them learn technical aspects of another. However, the core sessions in Health and Nutrition and the Role of the Volunteer in Development are presented to the entire group. For example, as Phase II and III are carried out, half the people concentrate on Fuel-Saving Cookstoves, and half on Pedal/Treadle Power. They are together for a number of core sessions, but during most the the technical sessions, they are involved in different areas. At the end of the phase, the groups switch, and the process is repeated using the core sessions from the other phase. Although the planning and logistics require additional thought and effort, this approach has been successful. It has reduced the need for additional staff, and has encouraged more participation, motivation and creativity as a result of smaller group size.

The Next Steps: Conducting the Program

We include here some considerations that are important to remember as you carry out the program:

- The experiential learning cycle is an essential part of training. Although it is not explicitly stated in each session, it is important that people have the opportunity to learn, examine, generalize about and apply new knowledge. Try to follow the experiential learning loop as often as possible, and encourage the participants to be aware of the process.

- Small groups often make learning easier and more lasting. It is helpful to limit the size of groups to three, four or five people. Groups may be formed on the basis of regional or country assignments, skill levels, individual preference, or other criteria established by the staff and participants.

- A variety of educational techniques is most effective. Experiment with role-plays, skits, panel discussions, brainstorming and other non-conventional ideas. Encourage people to use their creativity, and to examine which methods have the potential to be useful in community work. As you facilitate sessions, involve people and try to use techniques that others can learn. Remember that as you teach you will learn. Share your knowledge and motivate others to do the same.

- Feedback is an important two-way process. At the beginning of sessions, especially the technical ones, allot some time for discussion of your previous session. Occasionally, use the last part of a session to discuss activities and the facilitation skills of the person or people involved. Make the effort to invite feedback, and to give and receive it with openness.

- Sessions often require preparation. Be certain that you have read through a session, and that you completely understand it before the time comes to present it. Don't go into a session without preparing for it. Both you and the participants deserve the benefits of a session that has been well planned and conducted. Remember to outline the objectives and activities for people before the session begins, so that they will have an idea of what is expected of them and what they will be learning.

- There are often several purposes to each session. For example, the activities may be designed to meet a technical objective, and at the same time provide people with an opportunity to practice facilitation skills and examine group interaction. Highlight the various levels whenever possible, and encourage people to notice them, as well.

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Refers to the numbering of pages in each session. If one phase/session is excerpted from the manual, the sessions will still be numbered so they can be kept in order.

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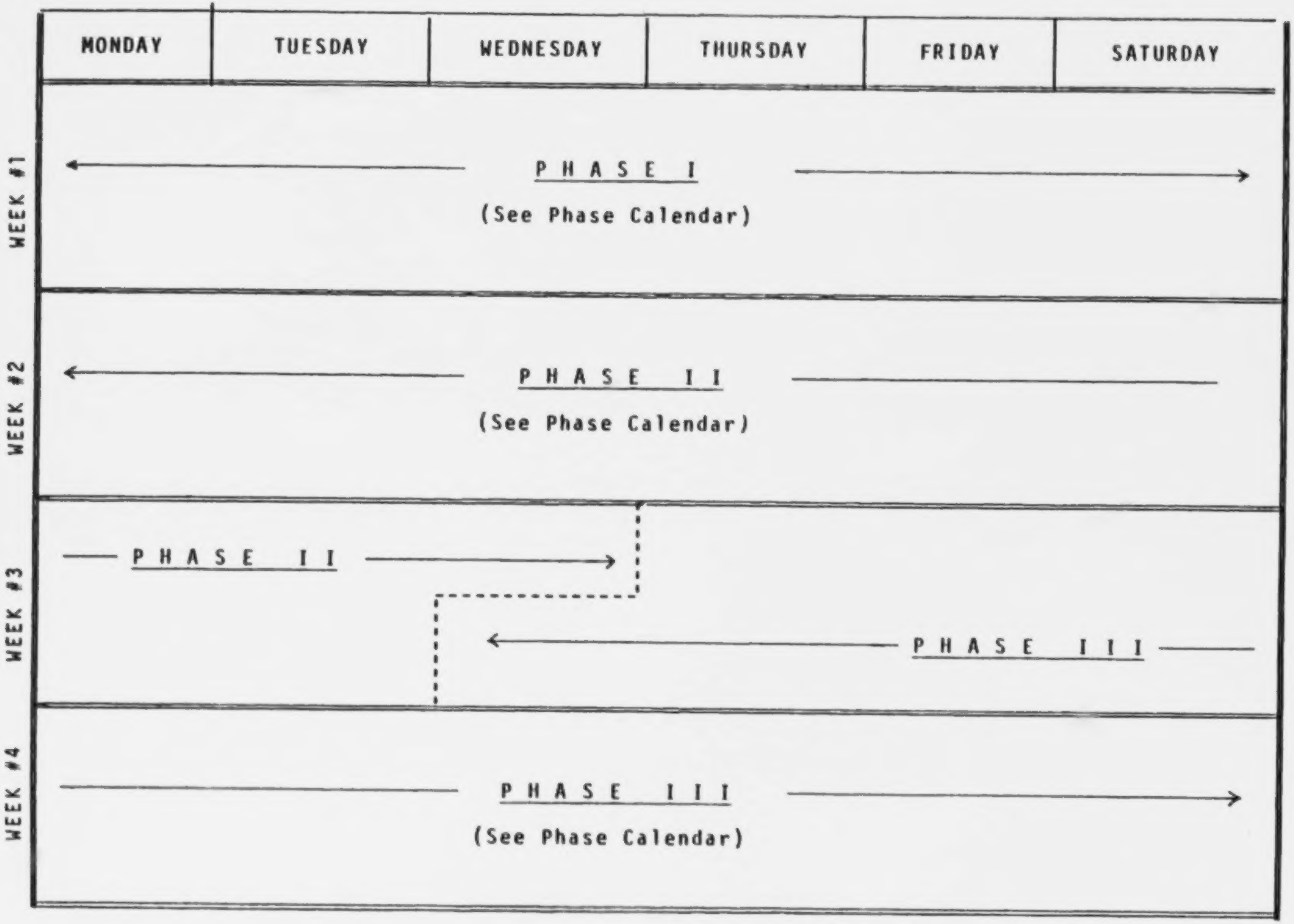
Page 1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INTRODUCTION

Basic to the purpose of this program is the belief that appropriate community technology represents as much a process as a philosophy. The process begins when people take an active role in their own education; it continues as they identify not only their needs, but also the resources, abilities and methods that will help them make decisions and address their problems in ways that are both sustainable and locally appropriate.

The philosophy of appropriate community technology reaffirms what most of the world's villagers know inherently -- that culture, social systems, politics, religion, economics and ecology are all threads in the same fabric of community life; and that technology exists only as a tool, a loom upon which all the other threads are woven.

The first role of the community facilitator is to respect and understand the intricacy and interdependence of the factors that define a community. Only then is it appropriate to assist and encourage people to utilize their talents, apply their creativity, and recognize options for change. As the process continues, the facilitator -- in this case, a Peace Corps Volunteer -- works with the community, learning from and building upon traditions and indigenous technologies that have evolved in response to local values, needs and conditions. Appropriate change must happen slowly, carefully, and from within; it should not be the result of outside imposition, regardless of good intentions.

An important part of this program is the recognition that technical expertise is significant and useful only when it is applied in balance with other qualities. It is of little importance for a person to be technically competent without the ability to work in cooperation with others, and help motivate them towards a more self-reliant and healthy life. For this reason, it is essential that future Peace Corps Volunteers develop a variety of complementary skills, knowledge and attitudes that will serve to weave together the many threads of appropriate community technology. This training program is committed to, and based upon, that process and philosophy.

DESIGN AND CONTENT OF THE PROGRAM

The training program is a model for future community work, and therefore emphasizes the parallels that exist between training and Peace Corps service. Throughout the eight weeks of the program, participants are encouraged to take a full and active role in their own education, and to make decisions that will affect them and the people with whom they work and live. They are urged to cooperate with others to identify and use the talents and resources that are available in the group, and to practice skills that help motivate people, instill within them a sense of self-confidence, and involve them in the process of their own education. In addition, the training program provides an opportunity for participants to examine their values, and to look carefully at the issues that will shape their role as community facilitators.

The approach to training is based on the principles of non-formal education, and is designed to strike a balance between structured learning and guided, yet independent discovery. The sessions, resources and methods that are included reflect the belief that adults are capable of self-direction and creativity when encouraged to apply their knowledge and skills in ways that are relevant to their lives. It is the intent of the program to offer a framework to future Volunteers, so that they may apply what they have learned in training to their service in the Peace Corps.

Program Components

Each of the technical and non-technical areas is related to and integrated with the other components of the program. This design highlights the connection and interdependence between technology and other aspects of development, and provides important parallels to community work. The training components are:

- Earthen Construction and Fuel-Saving Cookstoves
- Pedal/Treadle Power
- Solar Water Heaters
- Solar Agricultural Dryers
- Health and Nutrition
- The Role of the Volunteer in Development

The Technical Areas: Cookstoves, Pedal/Treadle Power, Solar Applications

The program offers skills training in all stages of technological development: the design, construction, operation, maintenance, repair and evaluation of small-scale prototypes and devices. The designs are selected to be as consistent as possible with the realities of rural areas in most of the world, and are based on the following criteria:

- Affordable, and low in capital investment
- Simple and adaptable in both design and scale
- Easily understood by people with little or no formal education
- Responsive to local needs and abilities
- Able to be constructed, operated, maintained, repaired and managed by the users
- Based on the use of renewable sources of energy and local resources, both human and physical
- Characterized by the potential to contribute to local cooperation, self-reliance and good health

During the technical sessions, people are encouraged to modify, adjust or adapt the technologies to meet the requirements of Peace Corps assignments. Participants are urged to concentrate on the process of applying new information and skills in ways that extend beyond the specific designs or techniques used in the program.

Health and Nutrition

This component includes a variety of topics that appear in specific health and nutrition sessions, as well as in each of the other program areas. The material covers:

- Regional and global health issues
- Cross-cultural perspectives on health traditions and systems
- Personal health maintenance and first aid
- Basic nutrition
- Maternal and child health
- The application of locally appropriate technologies to promote, maintain, restore and improve the health of the community.

The Role of the Volunteer in Development

The sessions and activities in this component provide a framework and a context for the skills and knowledge gained in the other areas of the program. The materials have been designed to stimulate thought, and to guide people as they articulate their philosophy about appropriate community technology and the role they will take during Peace Corps service. Throughout the component, participants are asked to look at their own cultural perceptions, and clarify their values. They analyze the implications of technological change, and examine the importance of including, in the entire development process, all who will be affected by such change. It is in this component that people learn and begin to apply the principles and techniques of non-formal education and adult learning. Through discussion, reading, role-play and a variety of other activities, people are encouraged to develop and practice the skills that will enable them to be effective and sensitive community facilitators.

Program Themes

A number of related and fundamental themes appear throughout the program; these guide the development of the skills and qualities that will be necessary during Peace Corps service. The themes are introduced in the first week of training, and serve as a foundation upon which the rest of the program is built. Together, the themes illustrate the integrated nature of community work, as well as the parallels that are found in this training program.

In each area and phase of training, there is a focus on:

- Principles and techniques of non-formal education and adult learning
- Methods and approaches to solving problems
- Development issues
- Cross-cultural perspectives
- Health maintenance and promotion
- The process of assessment and evaluation

Program Phases

The training program is divided into six structured blocks of time, termed "Phases." The first and last serve to introduce and conclude the program; each of the others is organized around a specific technical area, which is integrated with relevant information and activities from the other program components. Some sessions in each phase are designed to help people acquire, practice and apply technical and facilitation skills; others are included as core sessions, and complement the technical material with background information and added perspective. Within each phase, the sessions are presented in an order that helps people build upon previous knowledge, and apply what they have already learned about both technical and non-technical areas of community work. Following are descriptions of each phase.

Phase I: Introduction to Training

The initial phase includes an overview of the content and themes that comprise the program. Here, the learning approach used in training is presented, and the principles of non-formal education are introduced. There is an emphasis on identifying the parallels that exist between training and future Volunteer service: Participants identify and examine the skills and qualities they will need in order to be sensitive and useful in community work, then begin to practice effective communication and facilitation skills.

Phase II: Earthen Construction and Fuel-Saving Cookstoves

In this phase, there is a focus on both acquiring technical skills, and understanding the issues and considerations that influence the development of cookstove programs. The sessions in design, construction and application are integrated with related material in health, sanitation and the environment, communication skills, cross-cultural perspectives, and the effects of technological change on traditional societies.

Phase III: Pedal/Treadle Power

The major technical themes are the design, construction, use and potential applications of devices that use the principles of power transfer. These include mobile and stationary dynapods and other human-powered machines. Related studies include: maternal and child health, a view of community health and appropriate technologies, communication skills, and issues in international development. In addition, a mid-program evaluation takes place at the end of the phase.

Phase IV: Solar Water Heaters

In conjunction with the design, construction and use of solar prototypes and devices, there is an emphasis on the importance of needs and resource assessment, and communication and facilitation skills. As part of the health component, first aid training is included in this phase.

Phase V: Solar Agricultural Dryers

In both the technical and non-technical sessions, there is material included on food preservation and storage, issues of agriculture and land use, and possible methods of improving the health and nutrition status of a community through the use of locally appropriate technologies.

Phase VI: Concluding the Program: The Energy Fair

As training draws to a close, the program themes are gathered and used as a basis for a final project. The participants plan and hold a community-wide energy fair to interest and educate people, and to demonstrate what has been learned during the program. In this phase, people have the opportunity to apply their facilitation and communication skills, and to use their talents and creativity to plan and carry out a major project. There is a focus on all aspects of project development and the evaluation process. In addition, the final phase serves as a transition to Peace Corps service, and to future work in appropriate community technology.

Skills for Development Facilitators

As an outline and a summary of the knowledge, skills and qualities that are important for effective community work, the Skills for Development Facilitators have been compiled for use in this program (See Appendix A). The skills follow each stage and aspect of the facilitator's involvement, and include:

- Taking preparatory steps
- Establishing a dialogue
- Planning with the community
- Using the dialogue approach to carry out projects
- Evaluating the process

The Skills for Development Facilitators represent more than linear steps in the development of appropriate community technologies. They are part of a continuing process of building local self-reliance and capabilities. Each component of the program is designed so that all skill areas are emphasized throughout the phases of training. There is a balance of skill areas included in each phase. These skills are indicated in both the phase calendars and the individual sessions. It is intended that the skills be developed and practiced during the entire program, so that by the end of training people have had the opportunity to move through each stage in the process of community involvement.

NOTES TO THE TRAINING STAFF

This manual is intended as a resource to help plan, prepare for and conduct a program that is responsive to a variety of training situations. It is probable that you will use the manual in one of two ways: either in its entirety -- as developed, tested and evaluated, or in sections, when there is a need to focus on one or more of the technical components.

We encourage you to modify and adapt the materials to make them more useful. However, when making any changes, it is important to do so with care, in order to maintain the integrated nature of the program. It is essential to the effectiveness of training to provide a balance in the various skill areas, and to help people build upon and apply new knowledge in a way that is ordered and logical. Please read and follow the general guidelines that have been prepared to help you transform these training materials into a dynamic, appropriate tool for learning.

Some First Steps: Planning and Preparation

There are many steps that occur before training actually begins: defining the program, locating a site, identifying participants and staff, gathering resources and materials, and performing a host of other logistical and preparatory tasks that sometimes appear endless, but that must be done before the program can happen. We include here some perspective to help you get started:

* What is the scope and content of your program?
  If it is an eight-week appropriate community technology training cycle, then it is probable that very little will change. However, if it is a shorter program, such as one that will be used for in-service training or other workshops, you may follow the calendars designed for that purpose (See Appendix B: Two-Week Workshops). Even if you will be using only one part of this manual, please read through all the guidelines, and note the design and format of the program.

* Where will training occur?
  It is best to choose a site that is conducive to experiential learning. It should include adequate room for people to build the technical devices, work in small groups, and if possible, be outdoors during much of the program. There should be a classroom or meeting facilities at the site, and a reference library where there is a quiet environment for reading and study. Although not essential, it is useful for training to be held in or near a community. Such proximity offers participants the opportunity to gain valuable field experience in assessing needs, working with people to solve problems, and practicing communication and facilitation skills. In addition, there are often many resources available in an established community: schools, libraries, health centers, as well as local organizations, businesses, cooperatives and small industries.

- Who will participate?
  It is likely that the people who enter the program will represent a variety of backgrounds, abilities and outlooks. Use this diversity as a tool to promote learning among participants with sometimes very different levels of technical expertise, education and experience. It is a challenge that is worth the effort of all involved.

  During this program, it is expected that a person who has basic practical skills and a desire to learn will have the opportunity to develop sufficient skills, knowledge and attitudes to serve as an effective and sensitive Peace Corps Volunteer. Before training begins, it is helpful to assess the participants' skill levels to get a sense of the experience and knowledge that each person brings to the program. It is also valuable to find out as much as possible about specific Peace Corps assignments, so that people can direct their education to meet future job requirements.

- What are the staff considerations?
  It is important that the entire training staff be familiar with the principles and techniques of non-formal education and adult learning, and that they be comfortable with the educational approach and style of the program. The staff should be flexible, and able to "let go" so that the participants are encouraged to take an active role in their education. When there is faith in the training group, they will respond with a high level of motivation, learning and responsibility. These benefits are well worth any "loss of control" involved.

  Staff members should represent a balance of backgrounds and skills, and be able to complement one another's expertise. Each person should have practical skills in one area, an understanding of related issues, and a knowledge of the literature and resources in that field. It is helpful if the staff includes people who have lived and worked overseas, especially in the area of appropriate community technology. We suggest that the staff consist of at least one person in each of the following areas: the technologies (Fuel-Saving Cookstoves, Pedal/Treadle Power, Solar Water Heaters and Solar Agricultural Dryers); health and nutrition; development issues, including perspective on women's roles in the development process; and non-formal education and adult learning.

  Although the number of staff will vary with individual programs, it is best if there is at least one staff member for each five participants. This ratio ensures individual attention in all aspects of the program, and helps dispel the "we/they" dichotomy that sometimes exists between staff and participants.

  A staff training workshop should be scheduled before the program begins. This gives the staff an opportunity to build training skills, as well as to establish the cohesiveness necessary to function as a cooperative and effective team. The person who conducts staff training should be qualified and experienced in the educational approach used in the program, and have expertise in management training techniques. All staff members should participate in the workshop; it is crucial to the success of the program and should not be omitted.

If outside consultants are to be included in the program, consider and select them with care. It is important not to lose the focus of the program by including too many people who may not be familiar with the philosophy, methodology or details of training. However, we do recommend that local resource people be invited to participate in parts of the program, and that consultants be asked to lend perspective and provide additional information. Some suggested consultants include: community workers, appropriate technology practitioners, health and nutrition workers, artisans, farmers, and people who have lived and worked in other countries.

- What resources and materials will be needed?
For the most part, these will be defined by what is available and appropriate for the training situation. Although very little is essential, we recommend that you follow the resources listed in each session. Use the bibliography as a guide. Each of the entries is coded as to its use and relative importance in the program. (See Appendix C.) Some of the texts are available from Peace Corps, and others must be purchased. Order books, films, slides and any other resource material with time to spare. As much as possible, anticipate training needs so that the materials will be available when they are needed.

Be certain that there are enough tools, supplies and other materials before the program begins. If the suggested items are not available, substitute with something comparable. Use your ingenuity, and you will find that the participants will follow your lead.

If there is not an established reference library at the training site, organize one based on the recommended readings in the bibliography. Include material about the countries in which the participants will serve, and add any other relevant resources. Try to keep the library current so that the resources meet the needs of the people who use them. The care and maintenance of the library may be a responsibility of the training participants once the program is underway.

Note that some of the recommended resources are protected by copyright, and that permission must be obtained before reproducing them for general use.

Remember that resources are usually helpful, but seldom essential. There is as much importance in finding a way to do without something that was considered absolutely necessary as there is in using it for its intended purpose.

- What kind of technical preparation is necessary?

  In addition to gathering the tools and supplies, and locating adequate workspace, there is another preparation to be completed. The technical staff should think about the devices and materials to be used in the program, and determine if they are suitable for training purposes, as well as for in-country application. If the technical trainers have not already done so, they should build the prototypes and devices in order to gain added perspective on design considerations, construction techniques, time requirements, potential applications and possible problems. Such devices and prototypes may be used as demonstration models during the program.

- How will training be conducted?

  The program may follow the manual design, so that all participants go through the phases at the same time. Although, if the group is larger than nine or ten people, another option may be pursued: that is, Phases II and III, IV and V may be scheduled concurrently. Half the participants learn the technical aspects of one phase, while half of them learn technical aspects of another. However, the core sessions in Health and Nutrition and the Role of the Volunteer in Development are presented to the entire group. For example, as Phase II and III are carried out, half the people concentrate on Fuel-Saving Cookstoves, and half on Pedal/Treadle Power. They are together for a number of core sessions, but during most the the technical sessions, they are involved in different areas. At the end of the phase, the groups switch, and the process is repeated using the core sessions from the other phase. Although the planning and logistics require additional thought and effort, this approach has been successful. It has reduced the need for additional staff, and has encouraged more participation, motivation and creativity as a result of smaller group size.

The Next Steps: Conducting the Program

We include here some considerations that are important to remember as you carry out the program:

- The experiential learning cycle is an essential part of training. Although it is not explicitly stated in each session, it is important that people have the opportunity to learn, examine, generalize about and apply new knowledge. Try to follow the experiential learning loop as often as possible, and encourage the participants to be aware of the process.

- Small groups often make learning easier and more lasting. It is helpful to limit the size of groups to three, four or five people. Groups may be formed on the basis of regional or country assignments, skill levels, individual preference, or other criteria established by the staff and participants.

- A variety of educational techniques is most effective. Experiment with role-plays, skits, panel discussions, brainstorming and other non-conventional ideas. Encourage people to use their creativity, and to examine which methods have the potential to be useful in community work. As you facilitate sessions, involve people and try to use techniques that others can learn. Remember that as you teach you will learn. Share your knowledge and motivate others to do the same.

- Feedback is an important two-way process. At the beginning of sessions, especially the technical ones, allot some time for discussion of your previous session. Occasionally, use the last part of a session to discuss activities and the facilitation skills of the person or people involved. Make the effort to invite feedback, and to give and receive it with openness.

- Sessions often require preparation. Be certain that you have read through a session, and that you completely understand it before the time comes to present it. Don't go into a session without preparing for it. Both you and the participants deserve the benefits of a session that has been well planned and conducted. Remember to outline the objectives and activities for people before the session begins, so that they will have an idea of what is expected of them and what they will be learning.

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WEEK #6	PHASE IV		PHASE V			
WEEK #7	PHASE V (See Phase Calendar)					
WEEK #8	PHASE VI (See Phase Calendar)					

PHASE I: INTRODUCTION TO TRAINING

Health and Nutrition

The Role of the Volunteer in Development

PHASE I CALENDAR - Page 1

	DAY 1	DAY 2	DAY 3
A.M.	SESSION 1: Sharing Perceptions of Appropriate Technology: an Ice Breaker (Skill Area I) Tour of Training Site	SESSION 2: Defining Expectations of the Community Technology Training Program (I) SESSION 3: Group Resource Assessment (I)	SESSION 5: Development of Skill Criteria (II) SESSION 6: Cross-Cultural Awareness and Communication (I)
P.M.	Peace Corps Administrative Orientation	SESSION 4: Appropriate Education and Learning Processes Parts 1 and 2 (II)	SESSION 7: The Hollow Square (II) SESSION 8: Health in a Cross-cultural Context (I)

	DAY 4	DAY 5	DAY 6
A.M.	SESSION 9: Community Resource Investigation, Parts 1, 2 and 3 (I)	SESSION 11: Communication and Listening Skills (II) SESSION 12: Construction of Earthen Block Molds: A Focus on Group Dynamics (II)	SESSION 14: Global Energy Issues (I) SESSION 15: Introduction to the Evaluation Process (V)
P.M.	SESSION 10: An Exercise in Problem-Solving: Formulating a Plan for Well-Being (I)	SESSION 13: Construction of Earthen Blocks (IV)	SESSION 16: Evaluation and Integration of Training Themes (V)

SHARING PERCEPTIONS OF APPROPRIATE TECHNOLOGY: AN ICE BREAKER

Total time: 2 hours

Objectives:

- To get to know one another and encourage communication
- To find out what "appropriate technology" means to others in the group
- To set the climate for active participation in training

Materials:

- Four large symbols of the wind, sun, water and earth -- drawn on a single sheet of newsprint paper and posted
- List of underlined questions from Steps 4, 6 and 7 on a single sheet of newsprint
- Notebooks, pens

Trainer Notes

This session will require careful preparation. See the Trainer Notes under Step 4 for instructions.

Procedures:

Step 1. (5 minutes)
Give a brief overview of the objectives that have been written and posted.

Step 2. (35 minutes)
Explain that an exercise in learning and remembering names will follow. State the guidelines for the "name game" and start the exercise.

Trainer Notes

Any one of various games for remembering names can be employed at this point. One game that has been successfully used is as follows:

- Trainer begins by giving his/her name preceded or followed by a word which
  1. describes how the trainer is feeling at that moment and
  2. begins with the same first letter of his/her name (such as "Mike Motivated" or "Nancy Nervous").

Continued

Trainer Notes/Continued

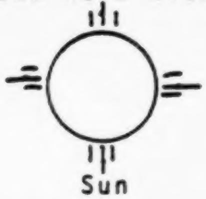
- Moving clockwise around the room, each participant then takes a turn at repeating all the preceding names and descriptors and adds his/her name to the end of the growing list.
- The game ends when all participants have added their names and have tried to repeat the list.

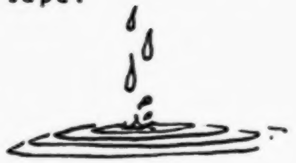
Step 3. (5 minutes)
When the exercise is completed, introduce the next step: exploring perceptions about appropriate technology and getting to know one another better.

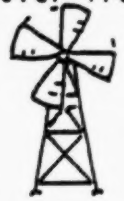
Step 4. (10 minutes)
Ask four people to uncover the symbols that have been posted around the room.

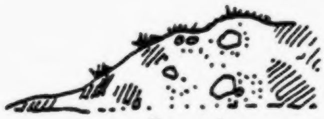
Trainer Notes

Draw symbols for the sun, wind, water and earth. They should be as abstract as possible. Avoid extraneous and possibly interfering or confusing details. The examples should be as simple as possible. The symbols can be covered with a blank piece of newsprint or just folded over from bottom to top and held with tape.


Sun


Water


Wind


Earth

Post the symbols at an equal distance from each other. If practical, have chairs near each one.

As participants are looking at the symbols, uncover the newsprint page where the following question is written:

Which symbol characterizes how you feel right now?

Ask participants to move around the room, examine the symbols and choose one, then move to that area and introduce themselves to others gathered there, sharing each of their reasons for choosing that particular symbol.

Step 5. (15 minutes)
After people have had a chance to talk for 10-15 minutes, ask a volunteer from each group to share some of the themes that came out in their discussions.

Step 6. (25 minutes)
Repeat the process using the following question:

Which symbol best represents what Appropriate Technology means to you?

Trainer Notes

If there is a great deal of interest in the small groups, you may choose to let this part go on longer.

As the groups report back,
* encourage brief comments
* make some generalizations about what people said in order to point out that many of them may have the same concerns, and
* relate their ideas to training goals and the program.

Step 7. (10 minutes)
When the groups have finished reporting, ask everyone to get their notebooks and reassemble.

Uncover the third and final question:

What symbol (or set of symbols) best represents your expectations for the training program?

Ask participants to draw the symbol(s) in their notebooks and individually list their expectations for the coming eight weeks.

Step 8. (15 minutes)
Conclude the session by reviewing the objectives and explaining that participants should keep their responses to the final question for later use as reference during an exercise on expectations.

DEFINING EXPECTATIONS OF THE APPROPRIATE COMMUNITY TECHNOLOGY TRAINING PROGRAM

Total time: 2 hours

Objectives:

- To review the content and major themes of the program
- To define and clarify expectations that the participants have of the training program
- To compare and contrast individual expectations with those of the program

Resources:

- "Introduction to the Appropriate Community Technology Training Manual"
- Training Schedule

Materials: Newsprint and felt-tip pens

Trainer Notes

It is important that the training staff participate in this session in order to develop a list of their expectations of the program.

Procedures:

Step 1. (15 minutes)
Briefly outline and explain the session objectives and activities.

Step 2. (5 minutes)
Have participants refer to the symbols and expectation lists that they have in their notebooks (see Session 1, Phase I) and spend a few minutes reviewing them.

Step 3. (30 minutes)
Have participants form small groups in which they discuss their expectations of the program. On newsprint, each group should develop a list of their five most important expectations. Then post the list.

Step 4. (45 minutes)
Reconvene the large group and review each expectation for clarity and understanding. Identify which expectations the training will meet directly, those that

will be touched upon, those which could be addressed with some schedule changes and those, given the practical limitations of the program, which may not be met.

Step 5. (10 minutes)
Distribute copies of the training schedule and the manual introduction. Explain that the manual introduction presents an overview of the program and an orientation to its overall purpose, while the training schedule will give the participants a day-by-day description of the training. Encourage any questions or discussion.

Trainer Notes

In order to make the connection between expectations and how they will be addressed during the program, it is helpful to refer to specific sessions that deal with the expectations listed by the group.

Step 6. (15 minutes)
Conclude the session by facilitating a discussion centered around the following questions.

* Were any of your expectations changed by this activity?

* Was there something that you learned in this session that you were not expecting during training?

* Is there anything that you have heard about the program that has not been discussed?

Trainer Notes

In addition to clarifying and defining the participant's understanding of the program, this final step helps participants decide whether or not the program meets their needs.

GROUP RESOURCE ASSESSMENT

Total time: 2 hours

Objectives:

- To share the skills, experiences, knowledge and interests of participants and trainers
- To practice gathering information using active listening and interviewing skills

Materials:

- Newsprint and felt-tip pens
- "Interview Format" on newsprint (See Step 4)

Trainer Notes

In order to promote a sharing of experience among all program participants, it is recommended that the entire training staff engage in this activity.

Procedures:

Step 1. (5 minutes)
Review the session objectives and procedures.

Step 2. (5 minutes)
Present a short talk on the value of a group resource assessment.

Trainer Notes

The talk should include the following points:

- Information gathering will serve as a useful skill during training and as a Peace Corps Volunteer.
- One of the first steps when entering a new community is to gather information about the skills, knowledge and experience of the group members in order to better assess the community's resources.
- By sharing these resources, we will enrich one another's knowledge and experiences.
- During this program we will all be serving in the roles of both trainers and participants at one time or another.

Step 3. (10 minutes)
Have the group brainstorm a list of interview questions which could help assess the group's skills, knowledge, experience and interests.

Trainer Notes

The resulting interview questions should be consolidated or in some other way pared down so that the list does not exceed 4 or 5 open-ended questions that will stimulate conversation.

One way of providing focus during the brainstorm is to post the key points to be included in the interview: skills, knowledge, experience and interests.

Step 4. (5 minutes)
Post and review the interview format.

Trainer Notes

The Interview Format:

Step 1. (5 minutes)
Find someone in the group whom you don't know and move to a comfortable, private location.

Step 2. (30 minutes/15 minutes per person)
Interview one another using the list of questions as guidelines.

Step 3. (10 minutes)
Complete written reports on the interviews.

Step 4. (5 minutes)
On a separate sheet of paper, complete the following statements, using the interview reports as a reference:

- (Name of Person) can be a resource to our group in the following ways . . .
- . . . is interested in finding other group members who . . .

Step 5. (10 minutes)
Share the interview sheets with your partner and make any modifications or additions.

Step 6. (10 minutes)
Post the interview reports and walk around the room scanning the other interview reports and noting any information of special interest.

Step 5. (1 hour, 10 minutes)
Have the participants interview one another.

Step 6. (10 minutes)
Facilitate a discussion of the group's overall impressions of the resources that exist within the training community.

Step 7. (15 minutes)
Conclude the session by asking the following:

- What do you feel that you learned about interviewing from this activity?

- What advantages and disadvantages do you anticipate in using interviews as a way of gathering information in your host country?

Trainer Notes

It is helpful to keep the interview reports posted for several days so that everyone can examine them more closely.

The reports should then be kept in a place where they are accessible and can be used as continuing resources throughout the program.

APPROPRIATE EDUCATIONAL AND LEARNING PROCESSES
PART 1: NON-FORMAL EDUCATION (NFE) AND INTERNATIONAL COMMUNITY DEVELOPMENT WORK

Total time: 2 hours

Objectives:

- To examine the principles of non-formal education
- To discuss ways in which non-formal education may be applied in community work
- To review examples of ways in which non-formal education is used in this training program

Resources:

- "Skills for Development Facilitators" (Appendix A) and the Manual Introduction
- Attachment I-4/1-A, "A Definition of Non-Formal Education"
- Attachment I-4/1-B, "A Comparison of Formal and Non-Formal Education"
- Attachment I-4/1-C, "The Participative and Directive Trainer"
- Srinivasan, Lyra, Perspectives on Non-Formal Adult Learning: Functional Education for Individual, Community and National Development, pp. 1-23

Materials: Newsprint and felt-tip pens

Procedures: Step 1. (15 minutes)
Distribute Attachments I-4/1-A and I-4/1-B, "A Definition of Non-Formal Education," and "A Comparison of Formal and Non-Formal Education." Read and discuss the definition of NFE found on the attachments.

Step 2. (15 minutes)
Give a brief talk on the background and foundations of NFE and its relationship to adult learning theory. Encourage questions and discussions.

Trainer Notes

For a concise overview of NFE and adult learning theory, refer to: Srinivasan, Lyra, Perspectives on Non-Formal Adult Learning: Functional Education for Individual, Community and National Development, pp. 1-23.

Step 3. (20 minutes)
Have participants identify/discuss some general ways in which NFE concepts might help them in their future role as Peace Corps Volunteers.

Step 4. (15 minutes)
Distribute Attachment I-4/1-B, "A Comparison of Formal and Non-Formal Education," and refer participants to their copies of the Manual Introduction: Skills for Development Facilitators (Appendix A). Briefly explain some of the ways in which NFE is used in this program.

Trainer Notes

Explain how NFE is integrated into the training program through the "Skills for Development Facilitators" and that participants will have opportunities throughout their training to develop and practice NFE techniques and methods. Mention as examples the "Independent Study" and the "Energy Fair" and point out that these opportunities will be introduced in more detail in future sessions. Also, mention that there will be opportunities to facilitate and co-facilitate sessions.

Step 5. (30 minutes)
Have participants form small groups and discuss any additional ways in which NFE concepts may be integrated into the training program.

Step 6. (15 minutes)
Reconvene the large group and have participants share their ideas. Encourage questions and discussion.

Trainer Notes

It is probable that in the course of this discussion certain ideas may be presented which would be of value to the program. You should note these and discuss their feasibility with the training staff.

Step 7. (10 minutes)
Conclude the session by distributing the Attachment I-4/1-C, "The Participative and Directive Trainer." Ask participants to study the list and explain that it will be a resource for the next day's session on the development of facilitation skills criteria.

A DEFINITION OF NON-FORMAL EDUCATION

One definition of non-formal education is that education:

> Which takes place primarily outside the school's formal hierarchy which extends from kindergarden to graduate school and
>
> Which is aimed primarily at helping people in such areas as literacy, learning a skill, better farming, better health, better nutrition, etc.

TEN QUESTIONS ABOUT FORMAL AND NON-FORMAL EDUCATION

1. What should be the basis for selecting students to be educated?
   * Formal schools frequently select students because they are already smart and will succeed.

   * Non-formal education is more likely to select students because they have problems and need help.

2. How should curriculum be made? Who should make it?
   * In formal education, curriculum is made by the "experts" in colleges and ministries.

   * In non-formal education, the curriculum arises from the need of the student to know, for example, to increase rice production, limit the size of families or how to run a machine, or prepare a family meal.

3. How should educators be judged on what they do and be accountable for what they do?
   * In formal education we say that the results of our work cannot be known for many years, until the child grows up.

   * In non-formal education the accountability is usually swift and immediate. The illiterate does or does not become literate. The farmer does or does not use a better variety of rice. The housemaker does or does not improve nutrition for her family.

4. How should we evaluate learners?
   * Formal educators like to grade people on the basis of tests and eliminate those who don't make it. We fail them.

   * Non-formal educators are more apt to evaluate people in terms of improvements and not to grade them or sort out on the basis of poor grades.

-Continued-

5. What should be the place of individual competition in education?
   * In formal education competition is on an individual basis, and in comparison to others.

   * In non-formal education,group learning and reinforcement is more apt to be stressed.

6. What is the proper use of time units in education?
   * In formal education we count it in years and think it an accomplishment when we can extend a program from two, say, to four years. As a result a person may now spend more than one-third of his life in school.

   * Good non-formal programs tend to end as soon as the student learns what he needs to know. In fact, some non-formal research indicates that students learn better in short programs than in long ones.

7. Who can teach?
   * In formal education those can teach who are duly certified.

   * In non-formal education anyone can teach who knows what is to be taught and how to teach it.

8. Who can learn?
   * In formal education those who can learn can be admitted.

   * In non-formal education those who have the need to know can be admitted.

9. What should be the role of compulsion in education?
   * In formal education we have many devices for making education compulsory, through laws and curriculum and professional requirements.

   * Most non-formal education is voluntary and people just as easily walk out of the program if they don't think it meets their needs. The student is the judge, not the teacher.

10. At what age do people learn best?
   * In formal education we tend to think that youth is for study and age is for work.

   * Non-formal education frequently mixes youth and age and assumes they can learn if they feel the need to know.

Adopted from Cole S. Brenbeck, "What Can Non-Formal Education Teach Formal Education about Innovation," INNOTECH/NEWSLETTER, Sept/Oct 1977, p. 10.

A COMPARISON OF FORMAL AND NON-FORMAL EDUCATION

A. PURPOSES

Formal Education	Non-Formal Education
1. Long-term and general Formal education is expected to provide the basis for an individual's whole future life. Therefore (even in technical fields) it is general in character.	1. Short-term and specific Non-formal education meets short-term learning needs of individuals and communities. It therefore emphasizes the learning of specific knowledge and skills and the inculcation of specific attitudes which result in immediately functional behavioural changes.
2. Credential-based The end-product of formal education is the acquisition of qualifications and certificates which enable individuals to obtain specific socio-economic positions in the wider society. Rewards are therefore deferred.	2. Non-credential based Non-formal education produces learning which is immediately valued in the context of the individual's or community's life situation. Rewards are tangible and may include improvements in material well-being, productivity, self-awareness, ability to control the environment, etc.

B. TIMING

Formal Education	Non-Formal Education
1. Long Cycle Formal education programs are rarely less than one year in length and usually last for much longer periods, often ten years or more. One level of study leads immediately on to the next.	1. Short Cycle Non-formal education programs are quite short, rarely longer than two years and often much shorter than this. Length will depend on the period required to achieve the learning objectives in question.
2. Preparatory Formal education is child-centered and future-oriented and provides the basis for future participation in society and economy.	2. Recurrent Non-formal education may relate to children or adults, depending on the immediate learning needs arising from the individual's roles and stage in life.
3. Full-Time Formal education takes place full-time and does not permit other parallel activities, especially productive work.	3. Part-Time Non-formal education is part-time and activities may be timed in a variety of ways to meet the needs and convenience of learners.

C. CONTENT

1. Input-Centered and Standardized The basis of the curriculum for formal education is a well-defined package of cognitive knowledge with limited emphasis on psycho-motor or affective consideration. The content is standardized across large groups of learners.	1. Output-Centered and Individualized Non-formal education is task- or skill-centered and designed to produce quite specific changes in the learners. Units are discrete and variable and may be related to the precise functional learning needs of individual participants or small homogeneous groups.
2. Academic The curriculum is founded in theory and isolated from the environmental and social action.	2. Practical The curriculum is dictated by the particular uses to which the learning will be put and consequently is closely related to environment of the learners.
3. Clientele determined by Entry Requirements Clientele are defined in terms of their ability to cope with the level of education being offered. Literacy is essential (except at the lowest level) and successful completion of lower levels is required for admission to higher levels.	3. Entry Requirements determined by Clientele Non-formal education is geared to the needs and interests of the potential clientele. Specific characteristics such as literacy or formal educational qualifications are not essential for admission.

D. DELIVERY SYSTEM

1. Institution-based Formal education takes place in highly visible and expensive institutions called "schools," whose sole purpose is educational.	1. Environment-based Non-formal education takes place in a variety of settings but emphasis is given to locales such as the work place or home which are not education-specific. Such specific facilities as are used are minimal and low cost.
2. Isolated Formal education programs are isolated from the socio-economic environment and from social action. Learners are removed from their own environments for substantial periods.	2. Community-related Non-formal education is conducted close to where learners live and work and the environment is functionally related to the learning which takes place.

3. Rigidly structured Formal education is rigidly structured around the parameters of time and the participants' age and/or performance. It involves uniform entry points, is graded into uniform units, is sequential and continuous. Clear inter-relationships exist between different programs.	3. Flexibly structured Non-formal education programs have varying degrees and types of structure, but a variety of relationships and sequences is possible within them. Programs are discrete and few relationships exist between them.
4. Teacher-centered Formal education involves a labor-intensive technology and emphasizes teaching rather than learning. Authority and control is vested in formally qualified and certified members of a teaching profession.	4. Learner-centered Non-formal education uses a variety of resources and technologies. Emphasis is on learning rather than teaching and a variety of personnel (often not professional educators) are utilized as facilitators rather than teachers.
5. Resource-intensive Formal education utilizes expensive plant and staff, involves a high opportunity-cost of student time and largely draws its resources from outside the immediate surrounding community.	5. Resource-saving Non-formal education economizes on resources by utilizing community facilities and personnel (especially at slack times) where possible, by keeping specific facilities low-cost and by part-time study.

E. CONTROL

1. Externally controlled Curricula and standards are externally determined and publicly controlled or supervised by national bureaucracies.	1. Self-governing Control is uncoordinated, fragmented and diffuse, involving a variety of agencies, often non-governmental. There is substantial autonomy at program and local levels, with an emphasis on local initiative, self-help and innovation.
2. Hierarchical Internal control is highly structured and based on role-defined relations among teachers and between teachers and learners.	2. Democratic Substantial control is vested in participants and the local community.

Adapted from Tim Simkins, NON-FORMAL EDUCATION AND DEVELOPMENT, Monchecter Monographs, 1976, pp. 12-13.

PARTICIPATIVE & DIRECTIVE TRAINING STYLES

	The Participative Trainer		The Directive Trainer
1.	Involves the trainee in creation or revision of program objectives, and/or the identification of individual learning needs and objectives; strives to keep objectives related to where trainee is and wants to go.	1.	Defines objectives for trainee achievement at the beginning of the program; holds to these throughout to maintain consistency and coherence.
2.	Assists trainees in identifying possible learning activities and in effectively structuring such activities.	2.	Decides what learning activities are most appropriate and expects trainees to follow this structure.
3.	Expects the trainee to learn by exploration and discovery, asking questions, making use of available resources and solving problems.	3.	Expects the trainee to learn primarily by absorbing material through lectures, readings, etc., by memorization or practice and by responding to trainer questions.
4.	Involves the trainees in decision-making; invites ideas, suggestions and criticism from the trainees.	4.	Makes the decisions or carries out decisions made by the staff; does not invite suggestions or criticism from the trainees.
5.	Structures the training so that unplanned and unexpected problems will be treated as learning opportunities.	5.	Follows the schedule closely; avoids problems or dispenses with them quickly so they will not interfere with the planned sequence or schedule.
6.	Promotes cooperative work among trainees and climate of openness, trust and concern for others.	6.	Promotes individual learning effort, accountability and competition among trainees.
7.	Promotes self-assessment by trainees and provides feedback of information needed by trainees to evaluate their own progress.	7.	Personally assesses trainee performance and progress, usually through formal tests.
8.	Involves the trainees in mid-course or final evaluation of training program, process, materials and its progress toward objectives and elicits suggestions.	8.	Does own mid-course or final evaluation of training program and its effectiveness; draws own conclusions about needed revisions.

APPROPRIATE EDUCATIONAL AND LEARNING PROCESSES PART 2: ADULT LEARNING THEORY AND HOW IT IS USED IN THIS TRAINING PROGRAM

Total time: 2 hours

Objectives:

* To examine different ways that people learn
* To discuss experiential learning as a basic method used in this program
* To examine ways in which the experiential learning model may be applied during Peace Corps service

Resources:

* Attachment I-4/2-A, "Learning Style Inventory"
* Attachment I-4/2-B, "Introduction to Adult Learning Theory"
* Attachment I-4/2-C, De Vries, James, "Extension, Training and Dialogue: A New Approach for Tanzania"
* Ingalls, Andragogy, pp. 1-12
* Srinivasan, Lyra, Perspectives on Non-Formal Adult Learning, pp. 1-23

Materials: Newsprint and felt-tip pens

Procedures: Step 1. (5 minutes)
Begin the session by reviewing the objectives and providing a brief overview of the procedures.

Step 2. (10 minutes)
Distribute Attachment I-4/2-A, "Learning Style Inventory," and have participants complete it.

Trainer Notes

Explain that the purpose of the inventory activity is to help participants understand and examine ways in which people learn best.

Ask participants not to read the section on scoring until the inventory has been completed.

Step 3. (10 minutes)
Explain the scoring procedure and have participants calculate their scores.

Trainer Notes

Your explanation of the scoring procedures should include a definition of the terms used in the inventory (abstract conceptualization, active experimentation, etc.), and should provide some examples of the meaning of each of the four abbreviations (CE, RO, AC, AE) presented.

Step 4. (10 minutes)
Briefly discuss the group's scores.

Trainer Notes

In order to stimulate discussion, ask if anyone was surprised by his/her scores. Ask for reactions to the inventory.

Step 5. (10 minutes)
Distribute the handout, "Introduction to Adult Learning Theory," and give the participants time to read it.

Step 6. (10 minutes)
Facilitate a discussion of the basic concepts mentioned in the handout by asking how those concepts relate to the four learning styles in the inventory.

Trainer Notes

This discussion should focus on some common characteristics of:

- The experiential learning cycle
- The four learning styles of the inventory
- The basic principles of adult learning
- Non-formal education
- The training approach of this program

A brief talk on these concepts may be included here. Recommended resources include: Ingalls, A Trainer's Guide to Andragogy, pp. 1-12, and Srinivasan, Lyra, Perspectives on Adult Non-Formal Learning, pp. 1-23.

Step 7. (20 minutes)
Distribute the De Vries article and have participants read it.

Trainer Notes

As they read the article, ask participants to keep in mind how the experiential learning approach may be useful in their community work as Peace Corps volunteers.

Step 8. (20 minutes)
After the article has been read, ask participants to:

* Choose one of the objections at the end of the article
* Join a group which has selected the same objection
* Develop a group response to the objection
* Write three key elements on newsprint and post so that all may see it.

Trainer Notes

Point out four corners of the room -- two for trainees choosing objection #1 and two for trainees choosing objection #2.

Step 9. (15 minutes)
Encourage a discussion by asking that a volunteer from each group review and explain the responses developed.

Trainer Notes

Ask for comments concerning any generalizations in order to see how the training methods used here may be applied in the field.

Step 10. (10 minutes)
Conclude the session by reviewing the experiential learning model and explaining that it is the basic model to be used throughout this program.

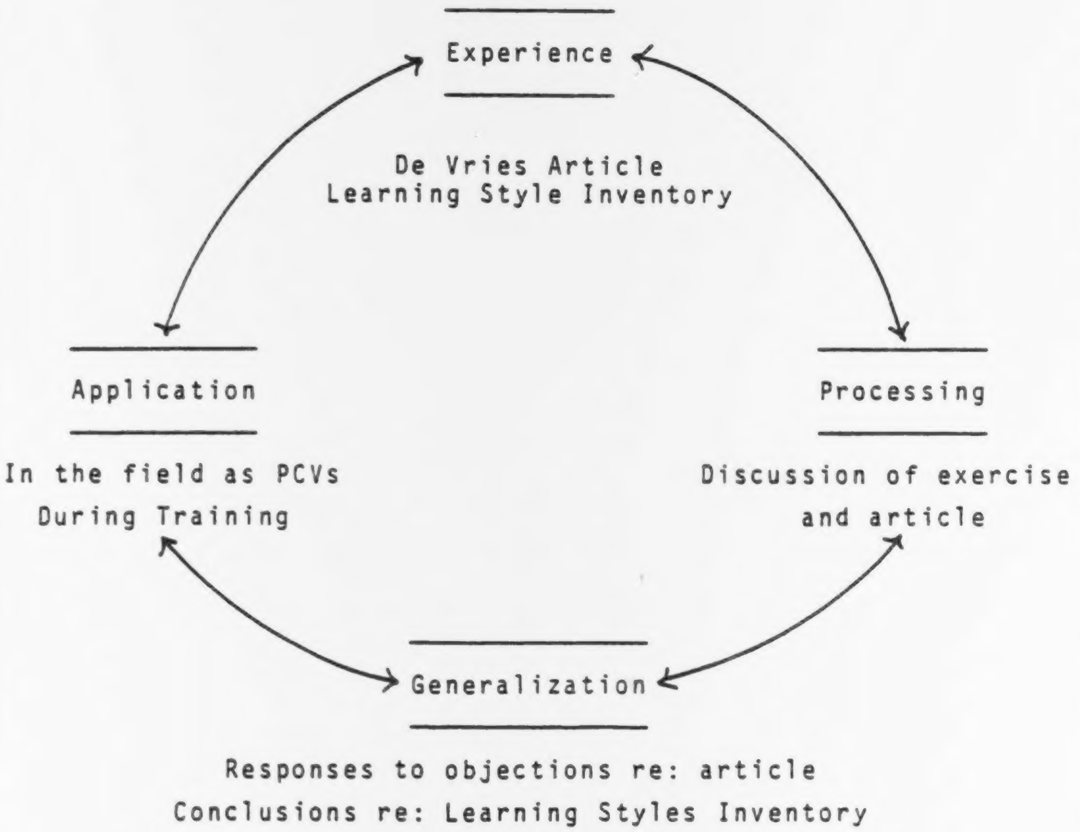
Trainer Notes

As an example, you should post on newsprint a graphic representation of the parallels among the major components of the experiential learning model and the activities carried out in this session.

Continued

Trainer Notes/Continued

The following diagram illustrates:


Experience
De Vries Article
Learning Style Inventory
Application
In the field as PCVs
During Training
Processing
Discussion of exercise
and article
Generalization
Responses to objections re: article
Conclusions re: Learning Styles Inventory

LEARNING STYLE INVENTORY

This inventory is designed to assess your method of learning. As you take the inventory, give a high rank to those words which best characterize the way you learn and a low rank to the words which are least characteristic of your learning style.

You may find it hard to choose the words that best describe your learning style because there are no right or wrong answers. Different characteristics described in the inventory are equally good. The aim of the inventory is to describe how you learn, not to evaluate your learning ability.

Instructions

There are nine sets of four words listed below. Rank order each set of four words assigning a 4 to the word which best characterizes your learning style, a 3 to the word which next best characterizes your learning style, a 2 to the next most characteristic word and a 1 to the word which is least characteristic of you as a learner. Be sure to assign a different rank number to each of the four words in each set. Do not make ties.

1.___discriminating	___tentative	___involved	___practical
2.___receptive	___relevant	___analytical	___impartial
3.___feeling	___watching	___thinking	___doing
4.___accepting	___risk-taker	___evaluative	___aware
5.___intuitive	___productive	___logical	___questioning
6.___abstract	___observing	___concrete	___active
7.___present-oriented	___reflecting	___future-oriented	___pragmatic
8.___experience	___observation	___conceptualization	___experimentation
9.___intense	___reserved	___rational	___responsible

FOR SCORING ONLY

CE____________	RO ____________	AC____________	AE____________
234578	136789	234589	136789

Scoring the Learning Style Inventory

To obtain your score on the four dimensions measured by the inventory, Concrete Experience (CE), Reflective Observation (RO), Abstract Conceptualization (AC) and Active Experimentation (AE), sum each column including only those words whose item number appears under the place for the total score. For example, for CE, total the ranks you have given for words 2,3,4,5,7 and 8 in the first column. Ignore the nonscored words in each column.

INTRODUCTION TO ADULT LEARNING THEORY

For most of us, the first associations we have to the word "learning" are teacher, classroom and textbook. These associations belie some implicit assumptions that we tend to make about the nature of the learning process. Our years in school have trained us to think that the primary responsibility for learning lies with the teacher. His training and experience make him the expert: we are more passive participants in the learning process. As students, our job is to observe, read and memorize what the teacher assigns and then to repeat "what we have learned" in examinations. The teacher has the responsibility of evaluating our performance and telling us what we should learn next. He sets requirements and objectives for learning since it is often assumed that the student does not yet have the experience to know what is best for himself.

The textbook symbolizes the assumption that learning is primarily concerned with abstract ideas and concepts. Learning is the process of acquiring and remembering ideas and concepts. The more concepts remembered, the more you have learned. The relevance and application of these concepts to your own job will come later. Concepts come before experience.

The classroom symbolizes the assumption that learning is a special activity cut off from the real world and unrelated to one's life. Learning and doing are separate and antithetical activities. Many students at graduation feel,"Now I am finished with learning; I can begin living." The belief that learning occurs only in a classroom is so strong that academic credentials are assigned great importance in hiring and promotion decisions -- in spite of the fact that psychological research has had little success in establishing correlations between performance in the classroom (grades) and success in later life.

As a result of these assumptions, the concept of learning seldom seems relevant to us in our daily lives and work. And yet a moment of deeper reflection says that this cannot be so. In a world where the rate of change is increasing rapidly every year, in a time when few men will end their careers in the same jobs or even the same occupations that they started in, the ability to learn seems an important, if not the most important, skill.

The concept of problem solving, on the other hand, evokes some associations that are opposite to those of the concept of learning. We tend to think of problem solving as an active, rather than a passive, process. Although we have a word for someone who directs the learning process (teacher), we have no similar word for the problem-solving process. The responsibility for problem solving rests with the problem solver. He must experiment, take risks and come to grips with his problem. Usually no external sources of evaluation are needed. He knows when his problem is solved.

Although general principles can emerge from the solution to a specific problem, problems are usually specific rather than general, concrete rather than abstract. Problem solving is not separate from the life of the problem solver. The focus of the problem solving is on a specific problem felt to be relevant to the problem solver; it is, in fact, his involvement in the problem that makes it a problem.

* * *

EXTENSION, TRAINING AND DIALOGUE: A NEW APPROACH FOR TANZANIA

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Extension, Education and Development

Training and extension work with farmers is both an educational effort and a means of development and a part of that development. Before we can begin to criticize traditional training and extension techniques and advocating new ones, it is important to be clear what we mean by development and how training and extension work relate to this goal. Until recently, development was usually defined in economic terms such as changes in the Gross National Product, per capita and economic living standards. Training, and especially agricultural extension, were viewed as an economic development tool; as an investment in human capital on which a return was expected. This implied a directly functional approach to teaching and learning which was focused on "practical" skills and immediate pay-offs.

This view has changed over the past ten years due to concerns about income distribution, dependency on government and other social and political concerns. Now almost every statement about training and development mentions the importance of participation, mobilization, equality and self-determination. Since independence, the party and the Tanzanian government have defined development as liberation. Development is:

> A permanent revolution for the total liberation of the people of Tanzania and Africa from all forms and manifestations of domination, exploitation, oppression, humiliation, weakness, racism, poverty, ignorance, disease and misery (Daily News, 1975)
>
> For development has a purpose: that purpose is the liberation of man. It is true that in the Third World we talk a great deal about economic development -- but the goods are needed to serve man; services are required to make the lives of men more easeful as well as more fruitful. Political, social and economic organization is needed to enlarge the freedom and dignity of men; always we come back to man -- to liberated man -- as the purpose of the development activity. (Nyerere, 1976)

Development is thus more than a change in material welfare, farming practices or yield per hectare or return per man-day of labor. Development involves changing people, changing their consciousness or awareness and helping them to become "beings for themselves" -- making their own political, cultural and economic decisions. "The expansion of (man's) own consciousness, and therefore power over himself, his environment and his society, must therefore ultimately be what we mean by development." (Nyerere, 1976)

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* Edited by the Training for Rural Development Staff - Tanzania

Education is thus both an end and a means of development. Development which depends on the actions of men requires a change in their consciousness, so that they are the determinant of their own actions. Farmers follow a given practice not because of traditionalism, but because they see it as the best method in the face of their own particular situation. To change these practices either demands force or a change in awareness which convinces them that a different form of action better meets their needs.

Raising the farmers' awareness is the role of both training and extension work. "Adult education has to be directed at helping men and women to develop themselves -- to think clearly -- to examine possible alternative courses of action; to make a choice between those alternatives in keeping with their own purposes; and to equip them with the ability to translate their decisions into reality." (Nyerere, 1976) The "developed" farmer is not the one who is "progressive" or follows the recommended practices (although he or she may do this); rather the developed farmer is the one who is critically aware of his or her situation and acts on it in accordance with this awareness.

The Traditional Approach

Education and extension in Tanzania and other developing countries have received a great deal of criticism. While in part this is unfair because of unrealistic expectations and a failure to see training and extension in the context of other factors influencing development work, much of the criticism is deserved. Part of the blame can be put on the traditional training and extension approaches used in the villages and elsewhere. This approach has variously been called the banking, empty cup, directive or top-down approach. Its essence is that the trainer or extension worker is the expert who knows (full cup) and tries to give (deposit as in the bank) this knowledge to the farmer or villager (empty cup) whose role is to passively receive and acknowledge what was received from the expert.

The assumption underlying this relationship is that the trainer or agent knows what is good for the farmer or village. Thus, the relationship is vertical and assumes a one-way flow of information from the top down. The farmer or villager is seen as ignorant, lacking knowledge, traditional and resistant to change. This means he or she is helpless and must be helped to develop, almost in spite of themselves. The farmer or villager is the passive learner, while the trainer or extension agent is the active educator.

In practice what this boils down to is that the trainer or agent, whether at a meeting, demonstration program or training session, is always in the position of telling villagers what to do. He tries to provide them with solutions to their problems much in the same manner a doctor provides prescriptions to medical problems. In a village one may find a list of the "ten commandments" of good farming posted. In a meeting one will hear the Katibu Kata exhort farmers to weed properly and the Bwan Shamba telling them that eight sprayings of insecticide are necessary to produce good cotton. Farmers rarely raise objections, because they know that such objections are not welcome and often accept the role of the ignorant, passive listener because they are continually told they are. They therefore exist in an oppressive environment over which they exercise little control. If they do object, they are quickly silenced by references to "wataalamu" research and "modern methods" (meaning they are ignorant and traditionalistic) or they need to work (meaning they are lazy). Rather than objecting openly and thus offering to educate the trainers or extension workers and be educated in return, most farmers remain silent. They go home and fail to put into practice what was suggested, even when they may have agreed to do so in the meeting.

The failure of farmers to follow the expert's advice is discouraging to the expert and reinforces the feeling that farmers irrationally resist change. As a result, educators and extension workers tend to work with those few who seem more open to their suggestions -- the "progressive" farmers -- and to advocate the use of pressure to force farmers to use recommended practices for their own good. As one RADO told me, "A farmer who refuses to follow recommended practices is like a sick man: you have to force him to eat and he will thank you for it when he becomes better."

Failure of the Top Down Approach

Unfortunately the farmer often does not become "better" in the sense that he or she obtains a significant benefit from the forced practice. This reveals one of the fallacies underlying the traditional approach: the assumption that all recommended practices are good and that the experts are always right. Experience and research in Tanzania have shown that many practices either recommended to the farmers or forced on them did not benefit the farmers and their rejection of them was quite rational.

Some recent examples are:

1. The use of fertilizer on maize in the lower altitude areas of Morogoro, Tanga and Iringa Region.
2. Growing maize and many other crops in monoculture.

3. Early planting and close spacing of cotton.

4. Production of cotton in many areas of the "Eastern Zone."

Thus, while many recommendations are good, experience has shown that when evaluated from the farmer's perspective, many do not solve the farmer's most pressing needs and are, therefore, unacceptable.

This brings up the second fallacy of the top-down approach: the assumption that farmers and villagers are ignorant. It is true that many of them have little formal education and are illiterate. It is not true that they have learned nothing and know nothing. (It is unfortunate that in Swahili, the same word, ujinga, can be used for both illiterate and ignorant, because the two cannot be equated.) Farmers, through experience and the informal sharing of ideas, have developed a wealth of knowledge about agricultural production and survival in an often harsh environment. They also have a better understanding of their problems, needs, priorities, resources, values, attitudes, local culture, etc. Educators and extension agents tend to be outsiders and members of a different socio-economic class.

Thus, both the extension agent or trainer and the farmer or villager have some knowledge necessary to bring about changes in practices. The scientific knowledge of the researcher needs to be complimented by the more natural knowledge of the farmer to bring about a critical understanding of the problem and the basis for action.

The third major fallacy of the top-down approach is the assumption that knowledge can be given or extended by the trainer and extension agent. Knowledge cannot be poured into the adult learner like tea into a cup. Informed action develops in learners as a result of interaction with information, the situation and fellow human beings. Learning is not an activity of the trainer, but of the learner, and involves a change from one way of understanding or doing something to another. Adults in particular have developed attitudes and ways of doing things. Learning often involves the rejection of existing ideas and acceptance of new ones.

This leads to the importance of understanding the farmer's present knowledge and understanding and these must form the foundation of any new learning. Only an active interaction with ideas and other people can result in the learner really understanding new ideas and making them his or her own, instead of them merely being someone else's ideas.

Finally, another major criticism of the top-down approach, particularly important in the Tanzanian context, is that it builds a dependency relationship between experts (often seen as representing government) and farmers and villagers. It means presenting the farmers with solutions to their problems, defined in the first place by the experts, instead of analyzing their problems with them, in order to fully understand them, and coming to a solution cooperatively. The traditional approach makes the farmer feel dependent on the continued advice of the trainer or extension agent, as it fails to teach him how to analyze and solve problems on his own. While the government and the party have accepted liberation as the major goal of development, the top-down approach to adult education and extension work encourages dependency and passivity.

Instead of seeing men and women as the end of development, it treats them as a means, tools to be manipulated as efficiently as possible in order to achieve the goals of those in power. In the face of the above, it seems fair to conclude that the present, prevailing approaches to adult education and extension work are not only ineffective but actually are detrimental to the development of Tanzanian farmers and villagers.

The Dialogue Approach

The dialogue approach, illustrated in Table 1, is the opposite of the traditional, top-down approach. Its essence is the horizontal sharing of ideas between trainers/learners, learners/trainers in a process of reflecting and acting on the world in order to understand it and control it better. It is based on faith in people, in his or her ability in cooperation with others, to be able to understand self and situation, and to act on it and change it.

The dialogue approach assumes that both the trainer or extension agent and the student or farmer know something about the subject of interest, especially if the goal is for the learner to apply what is to be learned. Although one may have more general or abstract knowledge and the other may have more informal and specific knowledge, this difference does not make one or the other superior in the situation. It is the shared knowledge both have in the situation which is superior. Within the constraints of each party's environment, each can learn and change as a result of interacting with each other.

While all farmers have some knowledge, they are not always aware of this knowledge. In fact, because they are constantly told that they are backward, lazy, ignorant and thereby made to accept that they are "hopeless," they often feel that they know nothing. When farmers can be drawn out in dialogue as a group, they are often surprised at how much they already know, collectively, about a wide range of production or development problems. It is important, in the beginning, to draw out what the farmers or villagers already know to be able to build on it. As Mwalimu Nyerere points out, by drawing out what the farmers know (which can only be done through dialogue) and showing the relevance of what is known to what is being learned, the trainer achieves three things:

> He has built up the self-confidence of the man who wants to learn, by showing him that he is capable of contributing. He has demonstrated the relevance of experience and observation as a method of learning to be combined with thought and analysis. He has shown what I call the "maturity" of learning -- that is, by sharing our knowledge, we extend the totality of our understanding and our control over our own lives.

The trainer's role in dialogue is not to present knowledge to the learner but to lead the learner to an examination of problems --to ask the learner to critically reflect and act on problems (problem-posing). Knowledge or learning grow out of this reflection-action cycle. The farmer will never learn the benefit of a practice and the problems associated with it until he has actually tried it and then thought about his experience critically.

Traditional Approach	Dialogue Approach
1. Educators teach and farmers are taught.	1. Educators and farmers are both involved in learning.
2. Experts know everything and the farmers know nothing.	2. Both have knowledge to contribute to joint learning.
3. Educators possess the authority of knowledge and have a monopoly on it -- which they perpetuate.	3. Knowledge is the property of everyone. No one can or should monopolize it.
4. Educators/experts think and farmers are thought about.	4. Farmers are encouraged to think on their own.
5. Educators/experts are active and farmers are passive during learning.	5. Both educators and farmers are active during learning.

Table 1

Neither will the trainer or extension agent know the value of his ideas until he has shared them with the learner and tested them out against the farmer's perceptions and experience. Dialogue thus requires both action and reflection, experience and thought. Without action, teaching is merely verbalism and amounts to exhorting the farmers to do this or that without showing them how to do it and thus has limited impact on their farming practices. Without reflection, extension work can become mindless activism in which farmers are forced to follow certain practices without understanding them and without the farmers themselves being developed.

Is Dialogue Feasible?

Let us examine two objections to the use of the dialogue approach often made by extension agents, educators and government officials.

1. The first is that it is impossible to dialogue with farmers or villagers because they know little or nothing about modern agriculture or how to make a village cooperative work.

2. The second objection is that it is too slow and expensive, that our problems need urgent solutions and therefore cannot wait for a long process of dialogue to take place.

DEVELOPMENT OF FACILITATION SKILLS CRITERIA

Total time: 2 hours

Objectives:

* To plan, design and carry out an activity using a training design format
* To identify a list of criteria for evaluating facilitation skills
* To demonstrate skills necessary to be an effective facilitator

Resources:

* "Skills for Development Facilitators" from Manual Introduction
* Attachment I-4/1-C, "The Participative and Directive Trainer"

Materials: Newsprint and felt-tip pens

Trainer Notes

* This activity serves as a "session within a session" and gives the participants an opportunity to develop skills in designing, practicing and evaluating a group activity.
* The design format that is used in this session will be used throughout this program. It can be helpful to Peace Corps volunteers in the design of group activities and workshops on the community level as well.

Procedures: Step 1. (5 minutes)
Introduce the session by explaining the importance of identifying and using facilitation skills during this program and in Peace Corps service.

Trainer Notes

Emphasize that one of the more important aspects of community work is to provide people with skills to solve problems creatively and in cooperation. This is the essence of good facilitation.

Step 2. (10 Minutes)
Present and explain the training design format.

Trainer Notes

Post the following design format on newsprint:

1. Identify and agree upon objectives.
2. Identify resources.
3. Design or select an activity or activities to meet the objectives.
4. Carry out the activities.
5. Evaluate the activities to see if objectives have been met.
6. Discuss the effectiveness of the process (Steps 1 - 4).

Explain that this training design format will be used in planning, designing, carrying out and evaluating this and other sessions throughout the training program.

Step 3. (10 minutes)
Begin implementing the training design format by reviewing and discussing the session objectives.

Trainer Notes

* The objectives for this session have already been set. Review and discuss them to illustrate the first step of the format.

* It is important that the participants agree that objectives are ones that they want to meet. Otherwise, there is little motivation or reason to meet them. For more background information, refer to Attachment I-4/1-C, "The Participative and Directive Trainer."

* If participants are not satisfied with the stated objectives assist them in modifying them or identifying additional ones.

Step 4. (10 minutes)
Help participants identify resources from within the group (e.g., those who have had experience in group facilitation, training programs, curriculum design, etc.) and make available the resources listed at the beginning of the session.

Step 5. (15 minutes)
Assist in the selection or design of an activity or activities which will meet the session objectives.

Trainer Notes

- * Some suggested activities include: brainstorming, discussion, small group meetings, etc.
- * Suggest that the procedures of this activity be outlined. Ask that one person keep time, that another observe the way the session progresses and that a third record the facilitation skills criteria as they are identified. (It is important that these criteria be recorded for copying and future distribution. See Step 8, Trainer Notes.)

Step 6. (50 minutes)
Assist participants in carrying out the activity.

Step 7. (10 minutes)
Have participants evaluate the activity.

Trainer Notes

The following questions will help in the evaluation:

- * Were the objectives met?
- * Was a list of facilitation skills criteria developed?
- * Was there active participation by all? Most? Some? Or, just by a few people?
- * Were effective facilitation skills demonstrated?
- * What went well?
- * What was not done well during the activity?

Use the list of criteria developed during the activity to check the skills demonstrated by the facilitator.

Step 8.
Review the training design format and conclude the session.

Trainer Notes

Your review of the format should center around the following questions:

- * Does this format have potential for use during Peace Corps service? Why?
- * What advantages and/or drawbacks does it have?
- * When might it be appropriate? Inappropriate?

Mention that a copy of the criteria will be distributed to all participants and will be used throughout the program for checking facilitation skills.

CROSS-CULTURAL AWARENESS AND COMMUNICATION

Total time: 2 hours

Objectives:

- To experience and examine feelings associated with being in another culture
- To infer meaning from verbal and non-verbal clues
- To examine culturally defined assumptions and perceptions

Resources:

- Batchelder and Warner, "The Albatross," *Beyond Experience: The Experimental Approach to Cross-Cultural Education*, pp. 131-136
- Shirts, "BaFa-BaFa," (cross-cultural simulation game)

Trainer Notes

The objectives of this session may be met in a variety of ways. The "materials" and "procedures" will depend upon the way in which you choose to meet the objectives.

In the resources listed above, we have suggested two cross-cultural simulation activities that have worked well in the past.

Both the "Albatross" and "BaFa-BaFa" stimulate thought and challenge culturally defined perceptions of what is "right" or "real." Both are simulations, in that they establish cultural and social settings which are artificial and temporary. However, the feelings and ideas that these simulations provoke are very real and not at all artificial. ("BaFa-BaFa" is the more participatory of the two activities. It may also require more than the allowed two hours to implement.)

There are other activities that guide people to examine their perceptions of reality within the context of culture and society. We encourage you to experiment throughout the training program and adapt materials to your specific needs.

In any case, you should be alerted to the fact that this session will require considerable advance preparation in both choosing and setting up the desired activity.

HOLLOW SQUARE

Total time: 2 hours

Objectives:
- To identify and discuss the dynamics involved in planning and implementing a project
- To examine and discuss the kinds of communication that influence the effective and satisfactory completion of a project

Resources:
- Ingalls, Andragogy, pp. 147-154
- Attachment I-7, Toolbox Parts List and Plans
- Pfeiffer and Jones, A Handbook of Structured Experiences for Human Relations Training, Vol. 1, pp. 32-40

Materials: Notebooks and pens and pencils, pre-cut wood pieces for the toolbox (See Attachment I-7), hammers, nails, saws, squares, tape measures.

Trainer Notes

- This activity will help the participants identify the problems that occur when one group makes plans that another group must carry out.
- A diagram of the hollow square can be found in Ingalls, page 151.
- Role descriptions and session procedures can be found in Ingalls, pages 147-154.
- We have found that instead of building a hollow square from paper or cardboard as described in Ingalls, it is useful for the participants to build a toolbox from plywood. The toolbox can then be used during the training program. It is more difficult to construct as it requires some woodworking skills. We have provided a parts list and plans (Attachment I-7) that take the place of the hollow square diagram on page 151 of Ingalls.
- This session requires considerable preparation if a toolbox is to be built, since all of the wood pieces need to be accurately cut and grouped so that there is one set of toolbox pieces for every 7 to 9 participants. It is also helpful, but not necessary, to have one completed toolbox for the participants to use as a model.

Continued

Trainer Notes/Continued

- * If a toolbox is to be built, it should be explained to the planners and observers that the words "hollow square" in the instructions should be replaced with the word "toolbox."
- * It is recommended that two trainers be involved with this session.
- * Remind the planners that they should not use the word "toolbox" or "box" during their instructions to the operators.

Procedures:

Step 1. (5 minutes)
List the objectives and outline the session activities.

Step 2. (5 minutes)
Have the participants form two large groups. Explain that one group will be known as the "planners" and the other group will be the "operators." Have a different trainer go with each group and lead them to separate locations.

Step 3. (5 minutes)
Have each of the two large groups (planners and operators) form small groups. Ask each of the small groups of planners to select one of their members to act as observer.

Trainer Notes

Additional small groups are not necessary if the training group is already small. If you are to build the toolbox, be certain that you have sufficient sets of toolbox parts, one set per group of operators, as well as the necessary tools.

Step 4. (10 minutes)
Distribute the appropriate role descriptions to each group of planners and operators, as well as to each of the observers. Also, distribute the tool box or hollow square parts to each group.

Step 5. (20 minutes)
Have the planners prepare their assembly instructions with the observers noting the process.

Step 6. (10 minutes)
Have the planners present their instructions for assembly to the operators.

Step 7. (30 minutes)
Have the operators assemble the toolbox or hollow square.

Trainer Notes

Explain that the observers should note the group dynamics and progress of the operators. The planners should observe in silence.

Step 8. (30 minutes)
Reconvene the groups and review and discuss the activity.

Trainer Notes

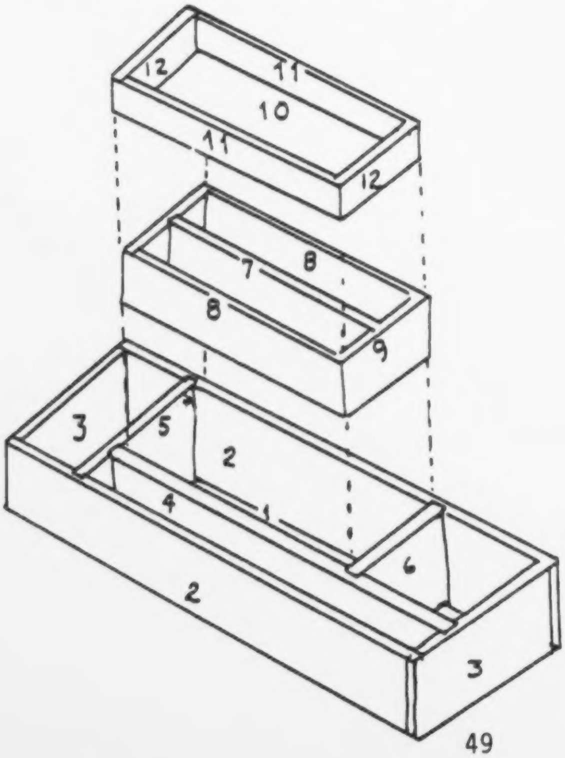
- Ask the observers to report on what they observed during the planning, instruction and assembly.
- Invite observations and discussion from the participants.
- Ask the participants to generalize about what went on in this process, what they learned, what went well, what didn't, etc.
- Encourage the participants to discuss how this exercise might apply to their service as PCVs: Will they be planners? Operators? Observers?

Step 9. (10 minutes)
Have the participants clean up the work area.

TOOLBOX PARTS LIST AND PLANS

Piece No.	Piece Name/Quantity	Length cm	Length in	Width cm	Width in
1.	Box bottom/1	84	33	35.5	14
2.	Box sides/2	86.5	34	20	8
3.	Box ends/2	35.5	14	20	8
4.	Long box divider/1	66	26	19	7.5
5.	Short box divider/1	37	14.5	19	7.5
6.	Short box divider/1	25.5	10	19	7.5
7.	Tray support center/1	53.5	21	12.5	5
8.	Tray support sides/2	52	20.5	12.5	5
9.	Tray support ends/2	24	9.5	12.5	5
10.	Tray bottom/1	51	20	21.5	8.5
11.	Tray sides/2	51	20	5	2
12.	Tray ends/2	24	9.5	5	2

NOTE: All wood is 12mm thick.
All dados are 6mm deep.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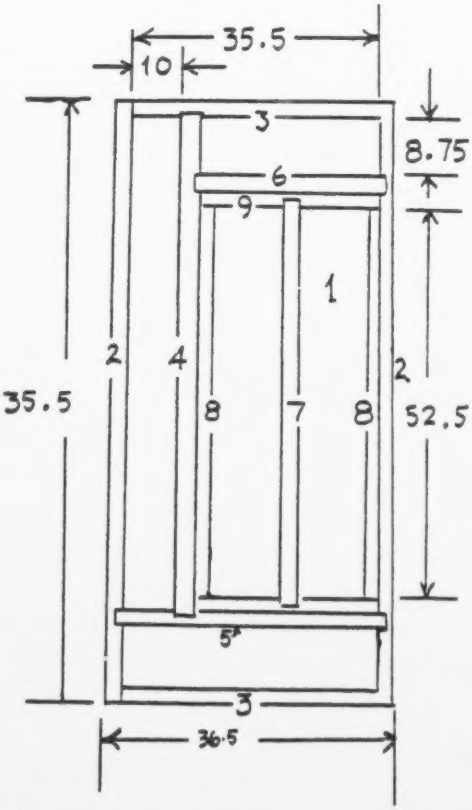
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35.5
52.5
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3
36.5

HEALTH IN A CROSS-CULTURAL CONTEXT

Total time: 2 hours

Objectives:

- To discuss the term "appropriate technologies for health"
- To share and examine some health beliefs, customs, taboos and practices
- To identify individual perceptions of health, illness and disease
- To define characteristics of "culture shock" and ways to live with it

Resources:

- Werner, Where There is No Doctor, Introduction, pp. 1-15 and 17-19
- Brownlee, Community, Culture and Care, pp. 173-186
- Audy, "Measurement and Diagnosis of Health"
- Volunteers in Asia, Transcultural Study Guide, pp. 133-138
- Attachment I-8-A, "Introduction and Goals of Health and Nutrition Component"
- Attachment I-8-B, "Culture Shock and the Problem of Adjustment to New Cultural Environments"
- Attachment I-8-C, selections from "Adapting Overseas in the Peace Corps"

Materials: Newsprint and felt-tip pens

Procedures:

Step 1. (10 minutes)
Distribute Attachment I-8-A and review the health and nutrition component of the appropriate technology training program. Invite questions and comments.

Step 2. (20 minutes)
Have participants form small groups and generate a list of health beliefs, customs, taboos and/or practices.

Trainer Notes

Distribute newsprint and felt-tip pens and have each group select a recorder. Each group should also identify one or two beliefs that:

* Are shared by at least two others in the group
* Are held by only one person
* Were held at one time but are no longer
* Have generated much interest in the group
* Are now being doubted

The following comments may clarify the activity:
Just as perceptions of health vary from culture to culture, there are often variations within a particular society. We have all grown up with certain beliefs concerning illness and well-being; some of our childhood perceptions are now considered superstitions, tales and quaint customs. There are other beliefs that we still hold as valuable, some of which are considered medically sound, and others for which the origins are forgotten and are of doubtful effectiveness. It is interesting to compare beliefs with those held by other people. Often, what one person considers superstition is another person's inviolable truth.

Encourage a few examples or provide one or two, e.g., feed a cold, starve a fever; don't swim after eating.

Step 3. (20 minutes)
Reconvene the groups and have the recorders post and summarize group responses. Discuss the responses.

Trainer Notes

Focus the discussion by raising the following questions:

* Which beliefs might be appropriate responses for health? Why?
* Where did some of the beliefs originate? Why have they persisted?
* What kinds of illnesses do these beliefs attempt to treat? Can we draw any generalizations?
* Which beliefs might be shared in other cultures?
* Which beliefs seem effective? Neutral? Harmful?

Step 4. (15 minutes)
Present a brief talk on perceptions of well-being. Encourage comments and comparisons with individually held perceptions.

Trainer Notes

Refer to resources for background material. Highlight:

* Early and universal perceptions of balance between body, mind and spirit; imbalance represents illness.

* Early 19th Century perceptions focused on disease and developed "germ theory" to note germs as universal elements causing illness.

* In 1946, the World Health Organization defined health as "a state of complete physical, mental and social well-being, not merely the absence of disease or infirmity."

* Recent ecological perceptions see disease as merely a phase or episode in which the body's ability to cope is diminished; "health is a continuing property, potentially measured by individual ability to rally from environmental insults, whether physical, infectious, social, psychological or chemical." (Audy, page 142)

Step 6. (5 minutes)
Have participants identify some common symptoms which let them know that they are getting sick. Post their responses on newsprint.

Step 6. (5 minutes)
Have the group list feelings and characteristics they have experienced in unfamiliar or uncomfortable situations. Invite the participants to compare the two lists.

Step 7. (20 minutes)
Introduce the term "culture shock" and ask for some definitions and experiences. Distribute Attachments I-8-B and I-8-C and allow time to review the material.

Step 8. (20 minutes)
Review the stages of culture shock and ask for suggestions on how to live with the culture shock experience.

Step 9. (10 minutes)
Review the session and invite observations and comments.

Trainer Notes

Suggest that participants read Werner, pp. 1-15 and 17-19, and Brownlee, pp. 173-186, for additional information.

INTRODUCTION AND GOALS OF HEALTH AND NUTRITION COMPONENT

Introduction

Basic to every society are shared perceptions about well-being and illness that comprise the knowledge applied when a member of the group becomes ill or is believed to be in a vulnerable state of health. Appropriate technologies for health refer to the various means and systems for maintaining or restoring the state of well-being according to cultural norms and realities. Therefore, it is important that the effective overseas development worker accept such health perceptions as valid, integral parts of the culture and respect the tradition they represent. For a development effort to be appropriate, it is crucial that there be an understanding that the concepts and customs regarding health and nutrition are intimately related to every other component of the total culture; there can be no separation of one part from the whole. The issues of development -- including technology, health and nutritional status, participation and integration of women, the role of the overseas worker -- are all inter-related and any change in one area ripples out to affect all others.

It is necessary that a broad background in development issues be provided and that adequate health and nutrition information -- especially in a cross-cultural context -- be made available to future development workers. In a training program that concentrates on alternative and appropriate technologies, the health and nutrition component must reflect deep concern with the relationships between technology and health status and with women and health, particularly the impact of change upon women and children in the developing world and the important role that women play in determining and maintaining family and community well-being.

A health/nutrition education plan should emphasize the cultural relativity of what constitutes appropriate knowledge, attitudes and applications. It should focus as many activities as possible on attaining high-level cognitive skills in order to facilitate providing the type of assistance that fosters community self-reliance and self-determination. Perhaps most important, it should instill the trainee with a sense of understanding how basic and universal is the need to maintain well-being and how connected it is to every aspect of life.

Goals of the Training Plan

Consistent with the health training philosophy established by the Peace Corps for all volunteers, this training plan is based upon the following goals:*

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* Stated in the Peace Corps Trainers' Guide for Basic Health Training for all Peace Corps Volunteers (compiled by N. McCharen, OPTC, July 1978)

- To enable volunteers to maintain and promote their own health and well-being while overseas

- To improve the quality of life of the people in the volunteers' communities (based on the WHO definition of health: ". . . a state of complete physical, social and mental well-being and not merely the absence of disease or infirmity.")

- To aid trainees in the development and/or practice of experiential learning processes

- To ensure that trainees fully understand the cultural context of health and disease as it is exemplified both in themselves and in their host communities

- To be sure that volunteers understand that they are not "barefoot doctors"

In addition, certain other goals have been identified as crucial to an integrated training program that emphasizes appropriate technology transfer, community development and the role of women in the development process. These are:

- To provide the trainees with an understanding of the syergetic relationship between health and technology

- To help trainees recognize the important role that women play in maintaining and restoring family and community well-being

- To facilitate the trainees' acquisition of skills and attitudes that encourage community well-being, self-reliance, self-determination and creative problem solving abilities

- To sensitize trainees to the concept that all aspects of a culture are inter-related and must be considered when introducing change in any one component

CULTURE SHOCK AND THE PROBLEM OF ADJUSTMENT TO NEW CULTURAL ENVIRONMENTS

from
PAPERS IN APPLIED ANTHROPOLOGY
by
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I would like today to make a few remarks about culture shock, a malady which I am sure has afflicted most of us here in varying degree. We might almost call culture shock an occupational disease of people who have been suddenly transplanted abroad. Like most ailments, it has its own etiology, symptoms and cure.

Culture shock is precipitated by the anxiety that results from losing all our familiar signs and symbols of social intercourse. These signs or cues include the thousand and one ways in which we orient ourselves to the situations of daily life: when to shake hands and what to say when we meet people, when and how to give tips, how to give orders to servants, how to make purchases, when to accept and when to refuse inviations, when to take statements seriously and when not. Now these cues which may be words, gestures, facial expressions, customs or norms are acquired by all of us in the course of growing up and are as much a part of our culture as the language we speak or the beliefs we accept. All of us depend for our peace of mind and our efficiency on hundreds of these cues, most of which we do not carry on the level of conscious awareness.

Now when an individual enters a strange culture, all or most of these familiar cues are removed. He or she is like a fish out of water. No matter how broadminded or full of good will you may be, a series of props have been knocked from under you, followed by a feeling of frustration and anxiety. People react to the frustration in much the same way. First they reject the environment which causes the discomfort: "the ways of the host country are bad because they make us feel bad." When Americans or other foreigners in a strange land get together to grouse about the host country and its people, you can be sure they are suffering from culture shock. Another phase of culture shock is regression. The home environment suddenly assumes a tremendous importance. To an American, everything American becomes irrationally glorified. All the difficulties and problems are forgotten and only the good things back home are remembered. It usually takes a trip home to bring one back to reality.

Some of the symptoms of culture shock are: excessive washing of the hands; excessive concern over drinking water, food, dishes and bedding; fear of physical contact with attendants or servants; the absent-minded, far-away stare (sometimes called the tropical stare); a feeling of helplessness and a desire for dependence on long-term residents of one's own nationality; fits of anger over delays and other minor frustrations; delay and outright refusal to learn the language of the host country; excessive fear of being cheated, robbed or injured; great concern over minor pains and eruptions of the skin; and finally, that terrible longing to be back home, to be able to have a good cup of coffee and a piece of apple pie, to walk into that corner drugstore, to visit one's relatives and, in general, to talk to people who really make sense.

Individuals differ greatly in the degree in which culture shock affects them. Although not common, there are individuals who cannot live in foreign countries. Those who have seen people go through culture shock and on to a satisfactory adjustment can discern steps in the process. During the first few weeks most individuals are fascinated by the new. They stay in hotels and associate with nationals who speak their language and are polite and gracious to foreigners. This honeymoon stage may last from a few days or weeks to six months, depending on circumstances. If one is a very important person, he or she will be shown the show places, will be pampered and petted and in a press interview will speak glowingly about progress, goodwill and international amity and if he returns home may well write a book about his pleasant if superficial experience abroad.

But this Cook's tour type of mentality does not normally last if the foreign visitor remains abroad and has seriously to cope with real conditions of life. It is then that the second stage begins, characterized by a hostile and aggressive attitude towards the host country. This hostility evidently grows out of the genuine difficulty which the visitor experiences in the process of adjustment. There is maid trouble, school trouble, language trouble, house trouble, transportation trouble, shopping trouble and the fact that people in the host country are largely indifferent to all these troubles. They help but they just don't understand your great concern over these difficulties. Therefore, they must be insensible and unsympathetic to you and your worries. The result: "I just don't like them." You become aggressive, you bank together with your fellow countrymen and criticize the host country, its ways and its people. But this criticism is not an objective appraisal but a derogatory one. Instead of trying to account for conditions as they are through an honest analysis of the actual conditions and the historical circumstances which have created them, you talk as if the difficulties you experience are more or less created by the people of the host country for your specific discomfort. You take refuge in the colony of your countrymen and its cocktail circuit which often becomes the fountainhead of emotionally charged labels known as stereotypes. This is a peculiar kind of invidious shorthand which caricatures the host country and its people in a negative manner. The "dollar grasping American" and the "indolent Latin American" are samples of mild forms of stereotypes. The use of stereotypes may salve the ego of someone with a severe case of culture shock but it certainly does not lead to any genuine understanding of the host country and its people. This second stage of culture shock is in a sense a crisis in the disease. If you overcome it, you stay; if not, you leave before you reach the stage of a nervous breakdown.

If the visitor succeeds in getting some knowledge of the language and begins to get around by himself, he is beginning to open the way into the new cultural environment. The visitor still has difficulties but he takes a "this-is-my-cross-and-I-have-to-bear-it" attitude. Usually in this stage, the visitor takes a superior attitude to people of the host country. His sense of humor begins to exert itself. Instead of criticizing, he jokes about the people and even cracks jokes about his or her own difficulties. He or she is now on the way to recovery. And there is also the poor devil who is worse off than yourself whom you can help which, in turn, gives you confidence in your ability to speak and get around.

In the fourth stage, your adjustment is about as complete as it can be. The visitor now accepts the customs of the country as just another way of living. You operate within the new milieu without a feeling of anxiety, although there are momemts of strain. Only with a complete grasp of all the cues of social intercourse will this strain disappear. For a long time, the individual will understand what the national is saying but he is not always sure what the national means. With a complete adjustment, you not only accept the foods, drinks, habits and customs but actually begin to enjoy them. When you go on home leave, you may even take things back with you and if you leave for good, you generally miss the country and the people to whom you have become accustomed.

Now before going on to consider the nature of culture shock, it might be well to point out that the difficulties which the newcomer experiences are real. If individuals come to a tropical area from a temperate one, they quite often suffer from intestinal disturbances. Strange foods sometimes upset people. In Rio, for instance, water and power shortages are very real. When these physical difficulties are added to those arising from not knowing how to communicate and the uncertainties presented by strange customs, the consequent frustrations and anxieties are understandable. In the course of time, however, an individual makes his adjustment. You do what is essential about water, food and the other minutiae of daily life. You adapt yourself to water and power shortages and to traffic problems. In short, the environment does not change. What has changed is your attitude towards it. Somehow it no longer troubles you. You no longer project your discomfort onto the people of the host country and their ways. In short, you get along under a new set of living conditions.

Another important point worth considering is the attitude of others to a person suffering from culture shock. If you are frustrated and have an aggressive attitude to the people of the host country, they will sense this hostility and, in many cases, respond in either a hostile manner or try to avoid you. In other words, their response moves from a preliminary phase of ingratiation to aggressive ridicule and on to avoidance. As you feel weak in the face of the host country people, you tend to wish to increase your dependence on your fellow countrymen much more than is normal. Some will try to help you; others will try to avoid you. The better your fellow countryman understands your condition, the better he is able to help you. But the difficulty is that culture shock has not been studied carefully enough for people to help in an organized manner and you continue to be considered a bit queer -- until you adjust yourself to the new situation. In general, we might say that until an individual has achieved a satisfactory adjustment, he is not able to fully play his part on the job or as a member of the community. In a sense, he is a sick person with a mild or severe case of culture shock as the case may be. Although I am not certain, I think culture shock affects wives more than husbands. The husband has his professional duties to occupy him and his activities may not differ too much from what he has been accustomed to. The wife, on the other hands, has to operate in an environment which differs much more from the milieu in which she grew up. Consequently, the strain on her is greater.

In an effort to get over culture shock, I think there is some value in knowing something about the nature of culture and its relationship to the individual. In addition to living in a physical environment, an individual lives in a cultural environment consisting of man-made physical objects, social institutions and ideas and beliefs. An individual is not born with culture but only with the capacity to learn it and use it. There is nothing in a newborn child which dictates that he should eventually speak Portuguese, English or French nor that he eat with a fork in his left hand rather than in the right or use chop sticks. All of these things the child has to learn. Nor are the parents responsible for the culture which they transmit to their young. The culture of any people is the product of history and is built up over time through processes which are, as far as the individual is concerned, beyond his awareness. It is by means of culture that the young learn to adapt themselves to the physical environment and to the people with whom they associate. And as we know, children and adolescents often experience difficulties in this process of learning and adjustment. But once learned, culture becomes a way of life, the sure, familiar, largely automatic way of getting what you want from your environment and as such, it also becomes a value. People have a way of accepting their culture as both the best and the only way of doing things. This is perfectly normal and understandable. To this attitude we give the name ethnocentricity a belief that not only the culture but the race and the nation form the center of the world. Individuals identify themselves with their own group and its ways to the extent that any critical comment is taken as an affront to the individual as well as to the group. If you criticize my country, you are criticizing me; if you criticize me, you are criticizing my country. Along with this attitude goes the tendency to attribute all individual

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peculiarities as national characteristics. For instance, if an American does something odd or antisocial in a foreign country which back home would be considered a purely individual act, this is now considered a national trait. Instead of being censured as an individual, his country is censured. It is thus best to recognize that ethnocentrism is a permanent characteristic of national groups. Even if a national criticizes some aspect of his own culture, the foreigner should listen but not enter into the criticism.

I mentioned a moment ago that specific cultures are the products of historical development and can be understood not by referring to the biological or psychological peculiarities of its human carriers but to an understanding of the antecedent and concomitant elements of the cultures themselves. Brazil and the United States, for instance, have different cultural origins and different culture histories which account for present day differences. In this case, however, the differences are not great, both cultures being parts of Western civilization. It might be useful to recognize here that the study of culture *per se* is not the study of individuals. Psychology is the study of individual personality. Sociology is the study of groups and group behavior. The student of culture studies not human individuals but the inter-relationships of cultural forms like technologies, institutions, idea and belief systems. In this talk we are interested not so much in the study of culture as such but its impact upon the individual under special conditions.

Now any modern nation is a complex society with corresponding variations in culture. In composition, it is made up of different ethnic groups, it is stratified into classes, it is differentiated into regions, it is separated into rural and urban settlement, each having its distinctive cultural characteristics. Yet superimposed upon these differences are the common elements of official language, institutions and customs which knit it together to form a nation.

These facts indicate that it is not a simple matter to acquaint oneself with the culture of a nation. Similarly, the culture of one's own nation is complex. It, too, differs by region and class. Americans, for instance, who go abroad in various government and business capacities, are usually members of the middle class and carry the values and aspirations of this class, some of which are an accent on the practical or utilitarian work as a means to personal success and suspicion of personal authority. Accustomed to working in large hierarchical institutions like business corporations, governmental agencies or scientific foundations which have a life of their own and persist in time, Americans tend to become impersonal. Individuals, no matter how able, are replaceable parts in these large institutions. To Americans, personalism which emphasizes a special individual, like a political leader or a business leader or a religious leader as solely responsible for the existence and success of an institution, is somewhat strange. To the American, it is the organization that counts and individual beings judged according to their ability to fit into the mechanism. This difference in inter-personal relationships often comes at least as a minor shock. A new pattern has to be established which has to take into consideration class society, the symbols of individual status, the importance of family relationships and the different importance given work, leisure and the values people strive for.

The rather sketchy remarks I have made here about culture and its elements is for the purpose of showing how important an objective treatment of your cultural background and that of your new environment is for understanding culture shock. There is a great difference in knowing what is the cause of your disturbance and not knowing. Once you realize that your trouble is due to your own lack of understanding of other people's cultural background and your own lack of the means of communication, rather than the hostility of an alien environment, you also realize that you yourself can gain this understanding and these means of communication. And the sooner you do this, the sooner culture shock will disappear.

The question now arises: what can you do to get over culture shock as quickly as possible? The answer is to get to know the people of the host country. But this you cannot do with any success without knowing the language, for language is the principal symbol system of communication. Now we all know that learning new language is difficult, particularly to adults. This task alone is quite enough to cause frustration and anxiety, no matter how skillful language teachers are in making it easy for you. But once you begin to be able to carry on a friendly conversation with your neighbor or to go on shopping trips alone, you not only gain confidence and a feeling of power but a whole new world of cultural meanings opens up for you.

You begin to find out not only what and how people do things but also what their interests are. These interests are usually expressed by what they habitually talk about and how they allocate their time and money. Once you get to know this value or interest pattern, it will be quite easy to get people to talk and to be interested in you. When we say people have no interests, we usually admit the fact that we have not bothered to find out what they are.

At times, it is helpful to be a participant observer by joining the activities of the people, to try to share in their responses, whether this be a carnival, a religious rite or some economic activity.

Yet the visitor should never forget that he or she is an outsider and will be treated as such. He or she should view this participation as a role playing. Understanding the ways of a people is essential but this does not mean that you have to give up your own. What happens is that you have developed two patterns of behavior.

Finally, a word on what your fellow countrymen can do to help you get over culture shock: It is well to recognize that as the persons suffering from culture shock feel weak in the face of conditions which appear insuperable, it is natural for them to try to lean heavily on their compatriots. This may be irritating to the long-term resident but he should be patient, sympathetic and understanding. Although talking does not remove pain, I think a great deal is gained by having a source of pain explained, some of the steps toward a cure indicated and the assurance given that time, the great healer, will soon set things right.

CULTURE SHOCK

Many people who enter and live in a new culture for more than a month experience what has been labeled "culture shock." This means the newcomer will experience feelings such as not belonging, alienation, unworthiness or inadequacy and may lose touch with his or her own real feelings. In many ways, the person will be experiencing real mental distress but what must be recognized is that culture shock is a normative process. It is something we all may experience to a greater or lesser degree.

We do experience culture shock differently, however. Some people tend to get very depressed. This may mean they withdraw from people of difference and have little energy to put forth in doing anything that is new or requires much effort. They feel victimized and they look at others -- particularly those in the new culture -- as being the cause of their pain and torment.

Others may search desperately for similarities with their own culture or background and then try to rely upon these similarites for support to the exclusion of other activities. Those just out of a university environment may try to recreate some of the dominant qualities of that environment in their new situation. If they were involved in sports, for example, they will try to get involved in similar activities in the new culture. If they previously relied a lot upon books, they will spend much of their time in the new culture simply reading. The tendency is to seek out something familiar from the past in an effort to dominate and exclude the present as well as to preserve one's own ego or sense of identity. This is normal and sometimes, in fact, useful to do.

Old-timers say culture shock can only be lived through, not dealt with. This does not seem to be true if you can just take the first step of recognizing that you are in culture shock. The whole thing is usually so deceptive (and we are so clever at inventing games to screen out the reality) that we cannot or will not admit what we are going through.

If we can get through to our real feelings, the best thing to do is to face the reality and then deal with it. At this point, we can acknowledge that we feel terrible (which is O.K. because it's what everyone feels in a similar situation) and we can look for actions we need to take to overcome these feelings. Action is terribly difficult for people in depression because they feel so ambivalent about things but it is only action that will help. Action cuts through ambivalence and begins to resolve it.

An important question to ask when you recognize that you are feeling "down" and lonely is simply, "What can I do to make myself feel more positive about things?" People in culture shock tend to be very puritanical and demanding of themselves, which only heightens the sense of discomfort and inadequacy. Think of the things that you could do which would be positive first steps Then change something which is appropriate to the culture and place you are in.

Following are some of the signs that may (but don't always) indicate you're on the old culture shock trip:

* Yearning constantly for certain foods or personal comforts not readily available in the new culture

* Escaping to maximum structure/minimum contact situations such as movies or formal restaurants

* Hanging around with fellow volunteers or others of your own ethnic group

* Finding yourself talking about "them," "these people" and blaming "them" for all the problems you're having in your work or in your personal adjustment

* Finding yourself drinking excessively or spending unusual amounts of time --

  Sleeping
  Eating
  Bathing
  Grooming yourself
  Organizing (and reorganizing)your room, equipment, etc.
  Daydreaming
  Playing cards (especially solitaire)
  Reading when you should be doing other things

* Avoiding contact with people of the new culture in any of a hundred other ways which all boil down to one fact: you may be in culture shock. You owe it to yourself as well as to those around you to start doing something about it.

One final note: the term "culture shock" is a very apt and descriptive term. However, it may also imply that there is something so alien about other cultures that they "shock" newcomers. We do not mean to imply that at all. Instead, when an individual enters a different culture, it is often the absence of the taken-for-granted, everyday things from the native culture which causes the shock. These everyday things can be such items as access to newspapers, television, books, friends, certain kinds of foods, etc. Because these are taken for granted, it may cause discomfort or "shock" when they are no longer available, or at least not as automatically or in the familiar form. Generally, it is during this period one realizes something is missing or different. Culture shock may be experienced before one has substituted and/or accepted new "everyday things" available in the new culture.

Resolving Culture Shock

Simply take note of the conditions present or absent when you experience happiness or discomfort.

THERE IS NO "BEST" ORDERING OF NEEDS.

Nor is the question of why our needs are as they are of any particular importance. In fact, perhaps the most central idea to be conveyed here is that WE SHOULD SATISFY OUR NEEDS, RATHER THAN SUPPRESS THEM.

Any other course of action leads to frustration, unhappiness and even an inability to continue in our roles.

The trick, of course, is to find ways to satisfy our needs in situations where our previous sources and techniques for need-satisfaction are impossible or inappropriate to employ.

Here are a few very general suggestions that many volunteers have found to be practical ways of satisfying their needs in a foreign culture. Check off the ones you think you might do and in the space below each section, list others you may want to try.

* * *

Ways of satisfying the need for affiliation:

_____ Writing letters

_____ Having a love life

_____ Finding a child or group of children to visit

_____ Finding an older person who has the time and patience to talk with you

_____ Going to visit with a close friend

_____ Sports, games, fishing

_____ ____

_____ ____

_____ ____

_____ ____

_____ ____

_____ ____

Ways of satisfying the need for achievement:

_____ Learning anything, especially local cultural information

_____ Doing extra work on the job

_____ Building things/fixing things

_____ Pursuing a creative hobby, such as weaving, musical practice, macrame'

_____ Recording your experiences, photography, creative writing

_____ Studying the language

_____ Doing technical reading, journals, etc.

_____ ____

_____ ____

_____ ____

_____ ____

Ways of satisfying the need for control:

_____ Settling in comfortably, arranging your belongings

_____ Building or acquiring new furniture or equipment for your home

_____ Painting and decorating your living quarters

_____ Making daily schedules, planning and budgeting time

_____ Planning excursions to other places

_____ Arranging to have experiences where you are the center of the activities, such as English lessons, magic tricks, any after-hours teaching or counseling

_____ Seeking out English language environments (preferably with local people)

_____ Finding a good language informant and/or good cultural informant

_____ Finding someone in the village who knows about village plans and will keep you informed

_____ ____

_____ ____

_____ ____

_____ ____

From: ACTION Pamphlet 4200.14, May '76, "Adapting Overseas in the Peace Corps"

COMMUNITY RESOURCE INVESTIGATION
PART 1: METHODS AND MODELS FOR INFORMATION GATHERING

Total time: 1-1/2 hours

Objectives:

- To examine and discuss two community analysis models
- To review information gathering techniques
- To prepare questions and an information gathering strategy for a community visit

Resources:

- Brownlee, Community, Culture and Care, pp. 1-41
- The Farallones Institute, The Integral Urban House, Chapter 2
- Attachment I-9/1-A, "Energy Flow in a Closed System Habitat"
- Attachment I-9/1-B, "The Keeprah Holistic Model"
- Attachment I-9/1-C, "Information Gathering Strategy"

Materials: Newsprint and felt-tip pens

Trainer Notes

This begins a three-part session which can easily take one full day to complete. It is suggested that you post the day's schedule one day prior to the session, so that people can plan accordingly.

Procedures: Step 1. (15 minutes)
Give a brief talk on information gathering. Invite comments, questions and discussion.

Trainer Notes

Explain that we are constantly gathering information and then filtering it, validating it and analyzing it to provide us with a framework for understanding and decision-making. The first steps in gathering information are the most critical. Describe information gathering as a process that has a series of steps.

Post the following model on newsprint for review:

Continued

Trainer Notes/Continued

Information Gathering Modes

Step 1	Step 2	Step 3	Step 4
Input	Process	Output	Goal
Gather info Convert to: Inferences Hypotheses Guesses	Evaluate info Test inferences Analyze	A working knowledge of how a community operates	To build a development strategy

Explain that we will be focusing primarily on Steps 1 and 2 of the above model since these steps can determine success or failure in our development efforts.

The following comments may be useful in talking about techniques of entering a new community:

- Look and listen.
- Remember, you are a guest.
- Allow time to sensitize to local ways and local ecology.
- Examine support systems: customs, services, technologies.
- Recognize your own biases as filters through which you see.
- Verify information through the process of triangulation (checking information by asking several people the same information).

Step 2. (15 minutes)
Distribute and review Attachments I-9/1-A, "Energy Flow in a Closed System Habitat, and I-9/1-B, "The Keeprah Holistic Model." Invite comments.

Trainer Notes

Explain that the use of a community analysis model can help us organize our approach when entering a new community and guide us to seek particular information. Explain that these models are two kinds of "systems" approaches: the Keeprah as sociological and the flow model as more biological. Ask people if they have any experience using community analysis models.

Step 3. (15 minutes)
Distribute Attachment I-9/1-C, "Information Gathering Strategy," and explain the community visit activity.

Trainer Notes

The adjoining community (town, village, neighborhood, etc.) and the training site provide natural settings for community resource investigations. The visits are intended to provide an initial view of a community and are not meant to give an in-depth understanding of all community systems, relationships, needs or concerns.

The community resource investigation will be carried out by information gathering teams. Two teams can be organized to carry out this investigation:

- One team can visit and gather information at the training site (looking at the training site as a community).
- A second team can visit the surrounding community.

Each team should develop a strategy for gathering the information independent of the other. The teams may use the "Information Gathering Strategy," "Energy Flow in a Closed System Habitat," and the "Keeprah Holistic Model" attachments as resources for designing their strategies. However, they should be encouraged to develop their own strategy by adapting the models found in the attachments or inventing their own.

Information gathering strategies should include:

- A community analysis model
- Methodologies to be used
- A list of questions
- A strategy for filtering information through triangulation

Inform the teams they have one hour to develop their strategies and one hour and 45 minutes to carry out the investigation.

Step 4. (30 minutes)
Have the participants form two information gathering teams and develop their strategies for community visits.

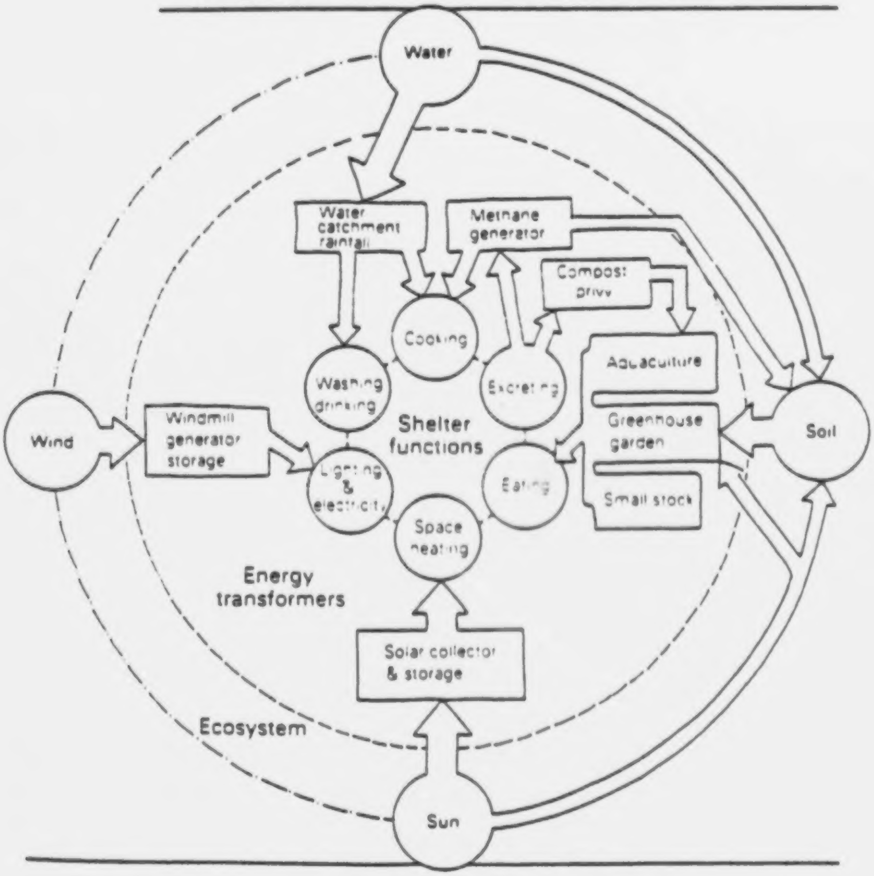
Trainer Notes

You may wish to refer the teams to the session resources for additional background material.

ENERGY FLOW IN A CLOSED SYSTEM HABITAT

A schematic diagram of nutrient and energy cycles in an integral habitat. Note that technology (the middle ring) mediates between ecosystem resources (the outer ring) and human needs and functions (the inner ring).

Energy Flow in a Closed System Habitat


Water
Water catchment rainfall
Methane generator
Compost privy
Cooking
Washing drinking
Excreting
Aquaculture
Shelter functions
Wind
Windmill generator storage
Greenhouse garden
Soil
Lighting & electricity
Eating
Small stock
Space heating
Energy transformers
Solar collector & storage
Ecosystem
Sun

THE KEEPRAH HOLISTIC MODEL

The community analysis model which you will be working with assumes that you can break down a community, for purposes of analysis, into a series of segments, or sub-systems.

Each segment, in the real world, interacts with the other to produce a continual movement and balance which keeps the community alive and moving. Change in one segment can affect another and vice versa. Intervention will do the same. For example, if you introduce improved pig-raising practices by penning up pigs and feeding them, rather than letting them forage for food (an economic intervention), you affect the community health by reducing pig-carried diseases.

Cutting across all segments of the community, you will find that there are common elements. These common elements are defined as:

A. Resources (human, natural and man-made)

B. Problems. Problems are defined as the gap between what is and what should be (what "should be" is often defined culturally).

C. Patterns. Patterns exist which give clues about what is there and how persons perceive them. These patterns of behavior often constitute cultural meaning, as well as biological necessity.

D. Leadership. Among the human resources, you will probably find that leadership exists in many of the sub-areas of the community.

The following model describes this approach to looking at community.

INFORMATION GATHERING STRATEGY

Here is a procedure you may wish to follow in developing your team information gathering strategy:

1. Decide which questions the team considers to be the most important.

2. Consider ways of using the skills and experience of your team members most effectively.

3. Decide whether you will work individually, in pairs or as a team.

4. Look at varying approaches to information gathering and select methods which seem most appropriate.

   For example:

   * Observation
   * Interviews
   * Review of written material
   * Asking questions
   * Flow analysis (sitting in one place and watching what goes on)

5. Develop an approach to validating your information through the use of triangulation.

6. Decide whether or not it would be appropriate to meet at a certain point during the actual information gathering process to revise or modify your strategy.

COMMUNITY RESOURCE INVESTIGATION
PART 2: THE COMMUNITY VISIT

Total time: 2 hours

Objectives:
- * To enter and establish rapport with a community
- * To carry out an information gathering strategy

Resources: Refer to Part 1.

Materials: As determined by the information gathering teams

Trainer Notes

Decide whether any special arrangements must be made with the community/ies prior to these visits.

Procedures: Step 1. (15 minutes)
Check with each team to verify the information gathering strategies. Invite comments, questions and discussion.

Trainer Notes

The trainer notes under Step 3 in Part 1 of this session outline the areas that should be included in the information gathering strategies.

Step 2. (1 hour, 45 minutes)
Have the teams carry out the community visits.

Trainer Notes

- * Be certain the teams know when they should reconvene.
- * The community visits may be followed by the lunch break. Participants may have the option of extending the activity or combining it with lunch.

COMMUNITY RESOURCE INVESTIGATION
PART 3: ORGANIZING AND PRESENTING THE INFORMATION

Total time: 2-1/2 hours

Objectives:

- To use the four roles for structured meetings
- To organize and present information gathered from the community visit
- To examine and contrast the community analysis models used in the community visits
- To generalize and apply the information gathering experience

Resources:

- Attachment I-1/3-A, "Four Roles for Structured Community Meetings"
- Refer to Part 1 for additional resources

Materials: Newsprint and felt-tip pens

Procedures: Step 1. (10 minutes)
Present the session objectives and review the session activities. Distribute, review and explain Attachment I-1/3-A. Invite questions and comments.

Trainer Notes

When reviewing and explaining the attachment, mention the following points:

- The group roles described are a particularly effective way of structuring group activities, meetings, etc.
- The process is direct and uncomplicated and has been used with great success by villagers in the Animation Rural Program in French-speaking Africa.
- The information gathering teams will be asked to use this format in this session when giving their presentations.
- These roles will be used throughout the training program.

Step 2. (35 minutes)
Have the information gathering teams organize their information and prepare a presentation.

Trainer Notes

To share this information, explain that the teams should:

- Organize the information and prepare it for presentation.
- Illustrate on newsprint the model used to gather information.
- Prepare an oral presentation involving the participation of each team member.
- Identify a discussion guide, timekeeper, recorder and process observer, as explained in the attachment, to help structure the presentation.
- Distribute newsprint and felt-tip pens to each team.
- Explain that the teams have 50 minutes to prepare their presentations.

Step 3. (45 minutes)
Have the groups give their presentations.

Trainer Notes

Allow for time at the end of the presentations for brief comments, questions and feedback on the success of the presentations. The person identified as "process observer" can also relate impressions.

To focus the discussion on the presentations, ask the participants:

- What did you like most/least about the presentation?
- What did you feel could be improved?
- What suggestions do you have for improvement?

Step 4. (10 minutes)
Have the participants take a short break.

Step 5. (30 minutes)
Reconvene the groups and discuss the survey process.

Trainer Notes

The following questions will help focus the discussion:

- How did your groups function?
- Was there participation by all?
- What types of decision making were used?
- Was there a delegation of roles and tasks?
- What improvements could be made in group process?

Continued

Trainer Notes/Continued

- Did you have to revise your strategies?
- Were the models effective tools for information gathering?
- In what ways do the different models organize information?
- Can you imagine combining the two models? Benefits? Problems?
- What methods of information gathering did you use?
- How did the interviewing go? Did you work in groups or individually?
- Did you use the process of triangulation to verify the information?
- What was the most difficult aspect of this experience?
- What improvements or differences could be made in information gathering methodology?

Step 6. (20 minutes)
Review and discuss the session objectives and activities.

Trainer Notes

Have the participants answer the following questions during the discussion:

- Has this been an effective way to practice information gathering skills and approaches?
- Would this be an effective way to gather information when entering a community in-country?
- What do you think you learned today? Have we met our objectives?
- How has our meeting gone? Has the roles format been useful?
- Can you imagine ways that the role format might be applied in-country?

FOUR ROLES FOR STRUCTURED MEETINGS

1. Discussion Guide: Guides the members through the meeting.
2. Timekeeper: Keeps track of the time.
3. Recorder: Records information for use during the meeting.
4. Process Observer: Watches and reports how members are working together as well as what they are accomplishing.

NOTE: Group members become stronger as they practice each role. So, rotate all four roles. Stronger members mean more group energy!

Discussion Guide

- Start the meeting at the scheduled time.
- Conduct attunement and "be here now" activities.
- Go around the group to see if everyone is ready to begin the meeting. Take care of individual needs before starting business.
- Be sure the group has a timekeeper, a recorder and a process observer.
- State the purpose of the meeting as you see it. Get an agreement. (If this means changing the purpose, that's all right. Consensus of members about the meeting's purpose or goal has to be reached before proceeding.)
- Reach an agreement on the closing time. Ask the timekeeper to give the group a 10-minute signal before closing time (or whatever warning they want).
- Ask the group to call out tasks to be accomplished in order to reach the goal. Ask the recorder to write them on the chalkboard.
- Assist the members in selecting the order of importance and the time allotted for each task.
- Guide the members in working through the agenda items.
- Ask for the process observer's report.
- End the meeting with attunement or other form of closure.

Timekeeper

- Act as an alarm clock, not as a judge. (That is, alert the others at the times they ask. If members agree on a time extension, be ready to respond to the "resetting." It's all right if tasks are not completed according to plan!)
- If no one else does it, be sure to get the time allotted for each task. (You don't have to do all of the work on time needs if others are willing to share this.)
- Remind the group members near the end of the meeting to save time for the process observer's report.
- Remind; don't reform. Be gentle.

Recorder

- See that a wall chart (or chalkboard) is in everyone's full view. Have marking pens or chalk and eraser ready for use.
- Write agenda items and their priority (order of importance) and the time allotted for each (if the group wants this kind of assistance).
- Keep whatever kind of record the members ask.
- Record the proposals and read them to the group at the end of the meeting.

Process Observer

Watch (like a camera, without judgment if possible) HOW the members work together. Ask for time at the end of the meeting to give your answers to the following questions:

- Did the members all agree on the meeting's goal?
- Was the style of leadership appropriate for the task?
- Was the timekeeping effectively carried out?
- Was recording, as needed, effectively carried out?
- Did members show feelings of friendliness and trust?
- Did everyone participate in some way?
- Did members reach their goal or, if not, did they understand why not?

On a scale of 1 to 10, rate the success of the group life (apart from the group task):

1 2 3 4 5 6 7 8 9 10!

Remember that you can take part in the meeting as well as observe it!

AN EXERCISE IN PROBLEM SOLVING: FORMULATING A PLAN FOR WELL-BEING

Total time: 2 hours

Objective:

- To develop a comprehensive plan to maintain and restore well-being during training and future Peace Corps service
- To resolve a current concern or problem using the OFPISA model

Resources:

- Ingalls, John, Andragogy, pp. 38-45 & 145-146
- Pfeiffer, John and J. Jones, A Handbook of Structured Experiences for Human Relations Training
- Samuels and Bennett, The Well Body Book, pp. 1-15 & 105-112
- Werner, David, Where There is No Doctor, pp. 233-244 & 140-216
- Attachment I-10-A,"The OFPISA Problem-Solving Model"
- Attachment I-10-B, "Problem-Solving Worksheet"

Materials: Newsprint, felt-tip pens, paper, pens, session objectives written on newsprint and posted

Procedures:

Step 1. (5 minutes)
Review the objectives and present the OFPISA problem-solving model. Distribute Attachment I-8-A to be read.

Step 2. (15 minutes)
Ask participants to suggest a sample concern common to the training group (e.g., loneliness, sickness, food, not enough research time). Then, following the OFPISA format, encourage them to work through the problem as you note information about it on the newsprint or board.

Step 3. (60 minutes)
Distribute the problem-solving worksheets, Attachment I-8-A, and have participants practice using the OFPISA model to identify and attempt to resolve a current concern or problem that relates to personal well-being.

Trainer Notes

Explain that it is important for participants to work in pairs in order to effectively address one another's concerns.

Step 4. (15 minutes)
Meet with the entire group and elicit observations and questions about the activity and the problem-solving model.

Step 5. (15 minutes)
Based on the OFPISA format, have participants develop a comprehensive plan for well-being that will be of use during training and Peace Corps service. Explain that the plan is to be completed as a homework assignment sometime before mid-program.

Trainer Notes

* Explain that the plan is a method for putting into practice material which will be discussed in health and nutrition sessions during the first half of the program and that such a plan provides an opportunity to identify and clarify one's definition of and approach to well-being.

* It is important to stress that the plan may take many forms (e.g., a graphic flow chart, a written report, a cassette tape, etc.).

* The plan should include:
  1. mental, physical and emotional components
  2. potential problems or concerns that must be resolved for improved health
  3. ways in which specific health problems will be resolved (e.g., treat alone, use an indigenous practitioner, go to a doctor)

* Questions to be answered:
  1. What are the symptoms of illness?
  2. What are the characteristics of good health?
  3. What lifestyle changes are necessary to promote better health?
  4. What illnesses or diseases are likely during training or Peace Corps service?

Step 6. (5 minutes)
Assign the readings in Werner (pp. 140-216 and 233-244) and in Samuels and Bennett (pp. 1-15 and 105-112) as resource material for the plan development.

Step 7. (5 minutes)
Discuss any questions concerning the exercise and set a date (prior to mid-program) for reviewing the plans.

THE OFPISA PROBLEM SOLVING MODEL

Buckminster Fuller said that a problem well stated is a problem solved. In order to state a problem completely and well, as much relevant information as possible must be gathered. The following model is designed to assist in the definition of the problem, the examination of all its aspects and an acceptable resolution to the conflicts and challenges presented by it.

In the model, first the original problem is stated. This may also be a goal, objective or issue.

Then, the factors relating to the problem are listed. The problem may be defined as a temporary equilibrium between factors that move toward change and those that restrain it. In order to solve the problem, the equilibrium or tension must be broken. The equilibrium may be likened to a force field: the problem is held static between opposing forces that push and pull. All factors are listed that have any bearing on the problem. One list notes the driving forces toward resolution and another notes factors that serve as restraining forces. The journalistic "w's" are useful in identifying the factors: who, what, why, where, when and how.

The problem redefined or restated is considered next. After all the factors both for and against resolution are identified, the real problem may emerge. This may be a simple restatement of the original problem or it may be another problem entirely, based on new information provided by examining the various factors.

Many and different ideas are generated by brainstorming: all ideas, suggestions and possible solutions are listed without discriminating among them. These serve to either increase the forces driving towards resolution or decrease the restraining forces. The brainstormed list may be comprised of logical, sensible ideas as well as those that seem crazy or not at all feasible. It should be remembered that most of the important or major inventions of the world had their origin in a "strange" idea that somehow worked! Therefore, judgment should be suspended during this phase and all creative suggestions listed, regardless of their initial appearance.

To devise a solution to the problem, a selection and comparison of the various ideas are made, thereby generating concrete and potentially viable solutions.

Each potential solution is evaluated to determine its acceptance by those affected by it. If the solution is not acceptable, another solution must be tried. If it is viable, then it is implemented and the problem has begun to be resolved.

One way of remembering this model is to term it the OFPISA (as in the leaning tower):

O - Original problem

F - Factors

P - Problem redefined

I - Ideas

S - Solutions

A - Acceptance

From CHP International, Inc., Staff Training Materials.
707B Davis Rd., Elgin, IL 60120)

ATTACHMENT I-10-B - Page 1

PROBLEM SOLVING WORKSHEET

O - Original Problem

F - Factors: Driving Forces Restraining Forces

P - Problem Restatement

I - Ideas

S - Solution

A - Acceptance

From CHP International, Inc., Staff Training Materials.
707B Davis Rd., Elgin, IL 60120)

COMMUNICATION AND LISTENING SKILLS

Total time: 2 hours

Objectives:

- To practice giving and receiving feedback
- To prepare for counterpart sessions
- To practice active listening skills
- To discuss impressions of the training program to date

Resources:

- Attachment I-11-A, "Feedback and the Helping Relationships"
- Attachment I-11-B, "Johari Window"
- Ingalls, Andragogy, pp. 164-174

Materials: Newsprint and felt-tip pens

Procedures: Step 1. (10 minutes)
Facilitate a discussion of the training program to date.

Trainer Notes

Ask for impressions of the overall program, or one aspect of it, or ask about any difficulties people have experienced in the new environment of Peace Corps training.

Step 2. (15 minutes)
Distribute Attachment I-11-A and review it with the group, highlighting different aspects of giving and receiving feedback.

Trainer Notes

Refer to Andragogy, pp. 164-174, for background information on communication and consultation skills. The following distillation of that material may also be used in your explanation:

- Effective communication underlies all mutually supportive relationships -- in personal life, in the work environment, and in formal as well as informal counseling situations. However, it takes practice to develop the skills necessary for helpful, non-threatening interactions.

Continued

Trainer Notes/Continued

- Perhaps the most important aspect of counseling is to be a good listener: that is, one who listens actively, knows how to interview unobtrusively and can provide accurate feedback to the person being interviewed.
- Interpersonal communication involves complex dynamics on both the verbal and non-verbal levels. If there is distortion in either sending or receiving the intended message, then misunderstanding and a breakdown in communications will result.
- A method of reducing distortion is called "feedback." This happens when a person responds to the sender of a message in a way that expresses how it was received. It is important to realize that feedback must be natural, not forced or imposed, and it must be based on mutual trust in order to be non-threatening.
- Feedback reflects perceptions of behavior and is only a measure of the way in which a situation is viewed. It should be clear, specific and related to the situation at hand. It should be descriptive and potentially helpful in a way that the receiver may decide either to use it or not.
- Feedback serves to clarify communication so that the helping relationship is enhanced through accurate perceptions of the concerns and problems being discussed.

Step 3. (15 minutes)
Distribute Attachment I-11-B, "Johari Window," and review it with the participants.

Trainer Notes

Explain that the Johari window model is instrumental in providing a framework for the continuing exercises in giving and receiving feedback. The model has been helpful in keeping the "feedback" theme in perspective and in encouraging the use of feedback as a constructive technique for building awareness, trust and communication skills.

Step 4. (10 minutes)
Present a demonstration of the feedback activity to be carried out in Step 5.

Trainer Notes

This demonstration step is considered optional. However, it has been found that when participants have the opportunity to see

Continued

Trainer Notes/Continued

and discuss a demonstration prior to beginning the activity in Step 5, they are more likely to understand the procedures and guidelines.

The procedures for carrying out the demonstration are as follows:

- Ask for two volunteers to help you demonstrate active listening skills.
- Place three chairs in the center of the room where they may be easily seen by all.
- Ask one volunteer to speak briefly (about 30 seconds) about an aspect of the training program that is most or least appealing.
- Ask the other volunteer to be an observer and to interrupt in 30 seconds.
- Try to paraphrase what the first volunteer has said.
- Ask the speaker if the paraphrase was accurate.
- Ask the observer about the accuracy of the paraphrase and for any observations about techniques and factors that either helped or hindered the communication: e.g., eye contact, body language, apparent sincerity.
- Ask if there are any observations from the rest of the group.
- At the end of the discussion, have another volunteer take your place. Then repeat the process with the three volunteers changing roles.

Step 5. (30 minutes)
Explain the guidelines and procedures of the feedback activity. Have participants divide into groups of three and carry it out.

Trainer Notes

Explain that this activity is designed to help build active listening skills, to provide practice in giving and receiving feedback and to sharpen skills in observation and paraphrasing.

Continued

Trainer Notes/Continued

There are three roles for each of the three group members: a listener, a person giving feedback or expressing a concern and an observer/timekeeper.

The procedures for carrying out the activity are as follows:

* One person speaks for 30 seconds as in the demonstration.
* Another listens carefully and provides a repetition or paraphrase of what has been said.
* A third observes the interactions between the two on both the verbal and non-verbal levels and interrupts at 30 seconds.
* The speaker gives feedback on the accuracy of the paraphrase.
* The observer shares what has been noticed about the interaction, giving feedback to the speaker and listener.
* The roles change until everyone has had the opportunity to be in each position.

Step 6. (10 minutes)
Have the entire group meet to discuss the activity.

Trainer Notes

Some questions to stimulate this discussion include:

* What factors or behaviors helped you give and receive feedback?
* What behaviors or characteristics made you feel understood or misunderstood by the listener?
* Why are active listening skills important during training and Peace Corps service?
* What problems and solutions were discussed? Was there any resolution of differences or concerns?

FEEDBACK AND THE HELPING RELATIONSHIP*

Some criteria for useful feedback:

1. It is descriptive rather than evaluative. By describing one's own reaction, it leaves the individual free to use it or not to use it as he/she sees fit. By avoiding evaluative language, it reduces the need for the individual to react defensively.

2. It is specific rather than general. To be told that one is "dominating" will probably not be as useful as to be told that "just now when we were discussing the issue you didn't listen to what others said and I felt forced to accept your arguments or face an attack from you."

3. It takes into account the needs of both the receiver and the giver of feedback. Feedback can be destructive when it serves only our own needs and fails to consider the needs of the person on the receiving end.

4. It is directed toward behavior which the receiver can do something about. Frustration is only increased when a person is reminded of some shortcoming over which he has no control.

5. It is solicited, rather than imposed. Feedback is most useful when the receiver him/herself has formulated the kind of question which those observing him/her can answer.

6. It is well-timed. In general, feedback is most useful at the earliest opportunity after the given behavior (depending, of course, on the person's readiness to hear it, support available from others, etc.).

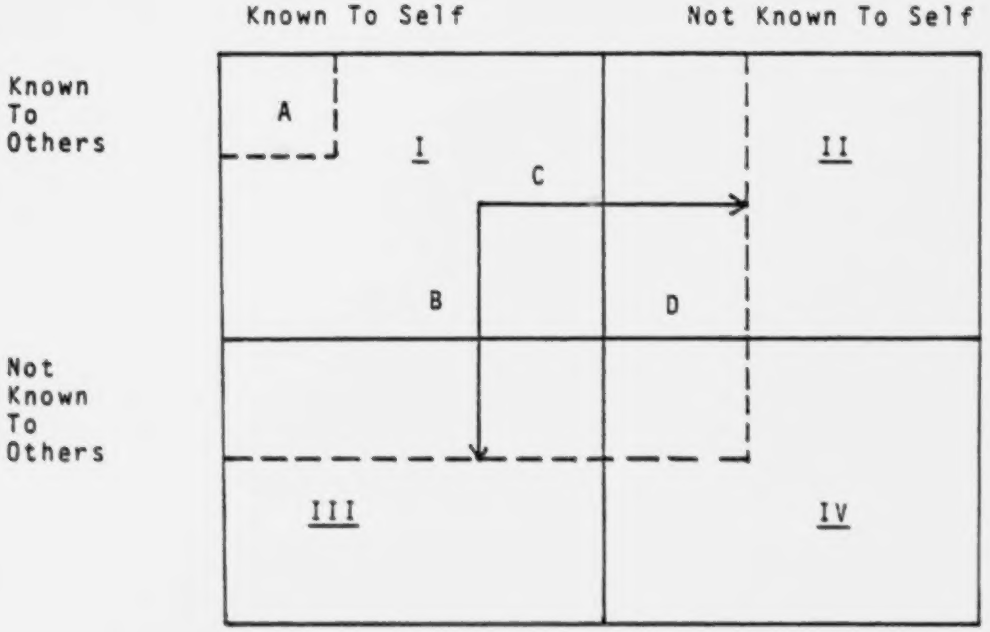
7. It is checked to insure clear communication. One way of doing this is to have the receiver try to rephrase the feedback he/she has received to see if it corresponds to what the sender had in mind.

8. When feedback is given in a group, both giver and receiver have opportunity to check with others in the group the accuracy of the feedback. Is this one person's impression or an impression shared by others?

Feedback, then, is a way of giving help; it is a corrective mechanism for the individual who wants to learn how well his/her behavior matches the intention and it is a means for establishing one's identify -- for answering "who am I?"

* Taken from the Reading Book: Laboratories in Human Relations Training, Washington, D.C.: NTL Institute for Applied Behavior Science, associated with the National Education, 1969.

JOHARI WINDOW


Known To Self
Not Known To Self
Known To Others
Not Known To Others
A
I
II
C
B
D
III
IV

Description of Areas:

Area I:	Information about self known to self and known to others. The area of free activity and interaction. "Public or Shared Self"
Area II:	Information about self not known to self and known to others. The Blind Area -- sometimes called the "Bad Breath Area."
Area III:	Information about self known to self and not known to others. Avoided or Hidden Area. The "Private or Secret Self."
Area IV:	Information about self not known to self and not known to others. The area of Unknown Activity. The "Area of Hidden Potential."

JOHARI WINDOW/Continued

Most people enter a new environment with a very small Area I (A). There is very little shared information and very little interaction can take place.

As the person becomes more comfortable, he shares some information about him/herself and expands toward Area III (B).

If the person is open for feedback to occur, he expands toward Area II (C).

The result of these two activities is that totally new information and potential in Area IV (D) is discovered. These new learnings from Area IV are directly attributable to interaction in the new environment.

* * *

NOTE:

There is no pressure to "reveal" yourself. There is nothing inherently "good" about having a large Area I. However, having an expanding or expandable Area I does increase your area of interaction and tends to facilitate the entering of a new environment.

CONSTRUCTION OF EARTHEN BLOCK MOLDS: A FOCUS ON GROUP DYNAMICS

Total time: 4 hours

Objectives:

* To construct earthen block molds
* To examine and discuss the characteristic decision-making styles within work groups
* To list some generalizations about effective group decision making

Resources:

* Attachment I-12-A: "Earthen Block Molds"
* Attachment I-12-B: "Effective Group Survey"
* Attachment I-12-C: "The Decision-Making Process"

Materials: Scrap lumber (5cm x 10cm or 2.5cm x 10cm/ 2" x 4" or 1" x 4"), nails, hammers, saws, metric tape measures, newsprint and felt-tip pens

Procedures: Step 1. (5 minutes)
Present the session objectives and outline the activities.

Trainer Notes

Explain that today's session is the first step towards the next day's activity of actually making earthen blocks.

Step 2. (5 minutes)
Distribute Attachment I-12-A: "Earthen Block Molds." Referring to the attachment, give instructions on how to construct the molds and present the tools and materials.

Trainer Notes

While giving the instructions, explain the following:

* The difference between individual and gang molds.
* The size of the mold depends upon the desired block size and its intended use.
* The mold dimensions listed on the attachment are interior dimensions.

Continued

Trainer Notes/Continued

- The participants should practice building the molds using metric measurements.
- Molds should be rigid and easy to handle.

Step 2. (5 minutes)
Ask the participants to form construction groups consisting of three individuals and explain that:

- Each group should utilize one of the three possible dimensions given for individual mold construction.
- An attempt should be made to work cooperatively with the active participation of all group members.

Step 3. (1 hour)
Have the groups build the individual molds.

Trainer Notes

It is important to circulate among the construction groups while they are working to check the progress and to see if the mold is rigid and built to specifications.

Step 4. (15 minutes)
Ask each group to join with another and discuss members' observations of the group process, both on a technical and interpersonal level.

Trainer Notes

Explain that the groups should select one of their members to act as a facilitator for the discussion.

The following questions may serve as guidelines for the group discussions:

- How did group members react regarding various individual technical skill levels in the group?
- Was it a help or a hindrance to work with people of a different skill level?
- How were decisions made during the construction process?
- What factors contributed to or impeded mutually-shared decision making?
- What would you do next time to help the group function more cooperatively?

Step 5. (15 minutes)
Have participants take a break.

Step 6. (1 hour)
Ask the participants to form groups of six and build a gang mold.

Step 7. (10 minutes)
Instruct each group to discuss the differences between working in small and large groups.

Step 8. (10 minutes)
Distribute Attachment I-12-B, "Effective Group Survey." Ask the participants to complete it and discuss their responses within the group.

Step 9. (10 minutes)
Distribute Attachment I-12-C, "The Decision-Making Process," and allow time for the participants to read it.

Step 10. (15 minutes)
Ask each group to select a member to facilitate a discussion of the potentially positive (satisfying) or negative (frustrating) consequences of each decision-making technique.

Also encourage the groups to recall examples of the decision-making styles used within their groups during the construction of the molds.

Trainer Notes

It is helpful to point out that all the styles, with the exception of consensus, often preclude the full involvement and commitment of some group members or ignore important issues that should be raised.

Mutually shared decision-making (termed consensus) is a positive alternative to other styles. Although it may require more time and increased sensitivity to the individual group members, it provides for the involvement and commitment necessary to group cohesiveness and cooperation.

Step 11. (20 minutes)

* Reconvene the groups and ask group members to share their views on the decision-making styles used by their group and the extent of cooperation within the group.

* Record their responses on newsprint.

* When several generalizations have been recorded, the session should end by reminding the participants that what remains to be done is for them to apply these generalizations.

Trainer Notes

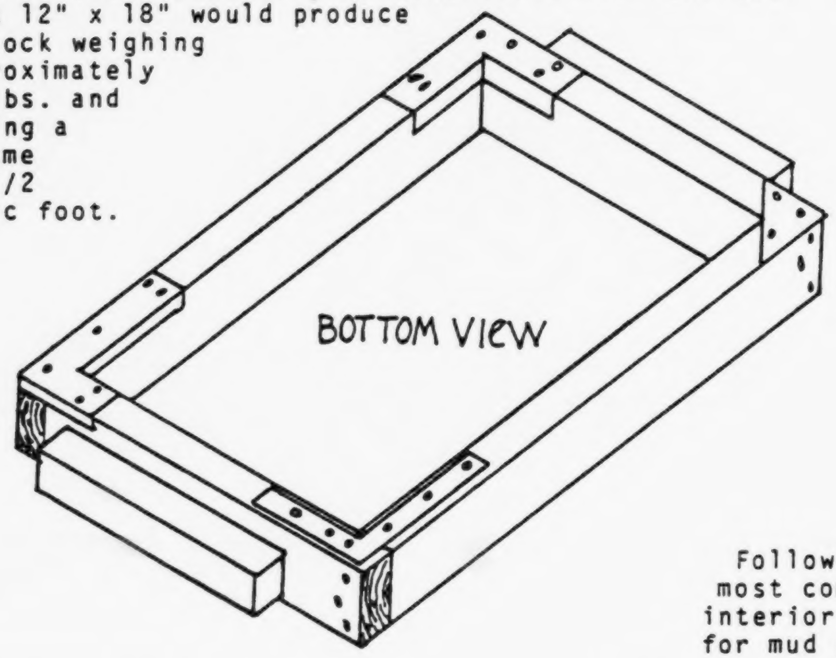
The intent of this wrap-up discussion is to have the participants develop some useful generalizations they will be able to apply in future work groups.

For example, there should be some agreement about what kind of behavior improved group performance. Or there may be certain things everyone agrees ought not to be done again.

Both of these are good examples of useful generalizations from what the participants have experienced, published (shared) and processed.

EARTHEN BLOCK MOLDS

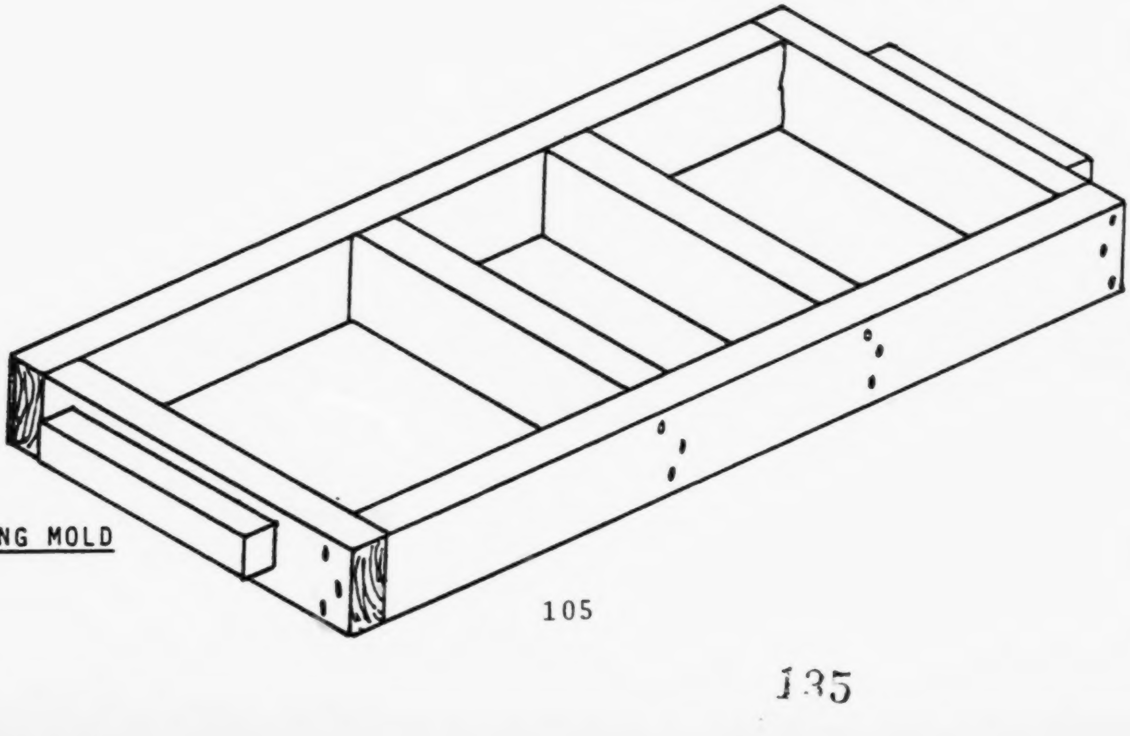
There are both individual and gang molds and are usually constructed from 2" x 4" (5 x 10cm) or 1" x 4" (2.5 x 10cm) lumber. Size of the blocks vary in accordance with end use. A mold of 4" x 12" x 18" would produce a block weighing approximately 50 lbs. and having a volume of 1/2 cubic foot.



INDIVIDUAL MOLD

Following are the most commonly used interior dimensions for mud block molds.

Inches	Centimeters
4 x 12 x 18	10 x 30½ x 46
4 x 7½ x 16	10 x 19 x 40½
4 x 10 x 15	10 x 25½ x 38



GANG MOLD

EFFECTIVE GROUP SURVEY

Group leaders, group facilitators and group members may sometimes want to assess the group's capability for working productively. This survey can be used by one or many, with the results posted and discussed toward the end of a meeting.

Directions: Circle the letter opposite each item on the survey below that best describes the group's interactions.

The scale used is:

A - All group members
B - Most group members (two-thirds or more)
C - About half the group members
D - A few group members (one third or less)
E - None of this group

During this (or the most recent) session, how many group members, including yourself:

1. Gave due consideration to all seriously intended contributions of other group members? A B C D E

2. Checked (by paraphrasing, etc.) to make sure they knew what was really meant before agreeing or disagreeing? A B C D E

3. Spoke only for themselves and let others speak for themselves? A B C D E

4. Viewed all contributions as belonging to the group, to be used or not as the group decided? A B C D E

5. Had the opportunity to participate in the group if they desired to do so? A B C D E

6. Tried to find the reason if the group was having trouble getting work done? A B C D E

7. Helped the group make decisions openly rather than by default? A B C D E

8. Helped bring conflict into the open so the group could deal with it? A B C D E

9. Looked upon behavior which hindered group process as a group problem, rather than as a "problem member"? A B C D E

Reprinted from Systematic & Objective Analysis of Instruction Training Manual. Portland,OR: Northwest Regional Educational Laboratory, 1970.

THE DECISION-MAKING PROCESS

We all live and work in groups and undoubtedly have experienced difficulty in arriving at group decisions. Some groups tend to break down when confronted with a decision for which a consensus is required. Others get bogged down in the interminable discussion of minor points or irrelevant side issues. Still others seek escape from their anxiety in Robert's Rules of Order, voting or calling upon the "chairman" to establish control.

Dr. Kenneth Benne (1960) has analyzed the prevalent reasons for the difficulty groups have in making decisions and has identified the following six blocks to decision making in groups.

1. Conflicting Perception of the Situation

   If group members view the problem at hand in different ways, communication can be impeded, resulting in a breakdown of the group.

2. Fear of Consequences

   The possible outcomes of an impending decision can overwhelm a group. Outside pressures on individuals or on the entire group may exert a paralyzing effect on its ability to come to a decision.

3. Conflicting Loyalties

   Every group member belongs to a number of different groupings than the one he may presently be engaged in. These multiple memberships can operate as hidden agendas or conflicting pressures within the decision-making group.

4. Interpersonal Conflict

   Personal differences or personality clashes can provoke defensiveness, antipathy and biased discussion, preventing a sound, fair decision from being made.

5. Methodological Rigidity

   Many groups are so frozen into Robert's Rules of Order or similar rigid methods for decision making that they are prevented from inventing or using other methods when the nature of the decision calls for one (e.g., consensus).

6. Inadequate Leadership

   When the entire group does not share the leadership functions and relies too heavily on a designated leader

THE DECISION-MAKING PROCESS - continued

(who may or may not be sufficiently skilled), then no group decision can be made and the commitment and responsibility to any decision is lessened.

TYPES OF DECISIONS

The following types of decision making are familiar to all of us:

1. Plops

   A decision suggested by an individual to which there is no response (e.g., "I suggest we shelve this question.")

2. Self-Authorization

   A decision made by an individual who assumes authority (e.g., "I think we should all write our ideas on the blackboard." --and proceeds to be the first to do so).

3. The Handclasp

   A decision made by two or more members of the group who join forces or decide the issue in advance (e.g., "That was a helpful comment, John. Yes, that's the course we're going to take.")

4. Baiting

   A decision made by pressure not to disagree (e.g., "No one objects, do they?), or a decision made by pressure to agree (e.g., "We all agree, don't we?).

5. Majority Rule

   A decision made by some form of voting.

6. Unanimity

   A decision made by overt and unanimous consent, often without discussion.

7. Polling

   A decision made by a form of voting which inquires, "Let's see where everyone stands." -- and then proceeds to tabulate the already expressed majority decision.

8. Consensus

   A decision made after allowing all aspects of the issue, both positive and negative, to be put forth to the degree that everyone openly agrees it is probably the best decision. This is not necessarily unanimity, but it constitutes a basic agreement by all group members.

CONSTRUCTION OF EARTHEN BLOCKS

Total time: 2 hours

Objectives:

- To compare various clay-sand mixes suitable for the construction of earthen blocks
- To construct earthen blocks

Resources:

- Adobe News Inc., "Adobe Today Newsletters"
- Boutette and Evans, Lorena Stoves
- Long, J. D., Adobe Construction
- Neubauer, L. W., Adobe Construction Methods, Manual 19

Materials:

- For the shake/feel/shine and ribbon tests: glass jar or bottle, water and soil samples
- For block construction: hoe, shovel, machete, appropriate earthen mixtures, water, straw and molds

Procedures:

Step 1. (10 minutes)
Introduce the session objectives and outline the procedures.

Step 2. (10 minutes)
Encourage the participants to share any experience or knowledge they may already have of earthen technologies.

Trainer Notes

During the discussion of the various types of earthen construction, mention the following applications:

- Wattle and daub
- Cob method
- Earthen blocks
- Compressed blocks
- Rammed earth
- Ferromud
- Bamboomud

Step 3. (10 minutes)
Describe the type of earthen blocks that will be made in today's session.

Trainer Notes

During your introduction, mention the following information:

* The utilization of mud blocks is often an appropriate substitute when access to manufactured construction material is limited and costs are high.

* Earthen blocks have many advantages: they are low-cost, durable and strong enough to be used as structural materials in a wide range of applications.

* Adobe buildings are fire-resistant, sanitary, dry and (due to the thermal properties of adobe) help equalize both hot and cold temperature extremes. Consequently, they are well-suited for use with passive solar heating designs.

* In addition, earthen construction is often an indigenous technology with which people may already be familiar.

* Earthen blocks are rectangular, shaped in molds, dried in the sun and then used in construction with mud or cement mortar.

* Bricks are made by mixing clay soil (28 - 48% clay) and water and then pouring the mixture into wood frame molds.

* Molds are generally 10cm x 30cm x 45cm (4" x 12" x 18"), having a volume of 16 liters (1/2 cubic foot) and weighing 23 kilograms (50 pounds).

* Blocks are left to dry three weeks, then turned on edge and left up to two weeks to cure.

Step 4. (15 minutes)
Have participants practice the shake/feel/shine/thread and ribbon tests. Encourage a discussion of their findings and observations.

Trainer Notes

You can provide a focus for this discussion by asking:

> How can this knowledge about soil composition be applied when making earthen blocks?

The participants should understand that these tests are to determine the relative amounts of sand and clay in the soil and to become familiar with the different soil types. A reference to these tests can be found in Lorena Stoves, pp.42-44.

Continued

Trainer Notes/Continued

Mention the following information during the discussion:

- Clay is the glue that binds the sand particles together.

- Because sand is rigid and doesn't shrink during drying like clay, a mixture of clay and sand is less likely to crack.

- It is not only the amount of clay in the mixture but the type that affects cracking. Some clay types (Kaolin, for example) have a much lower expanding and shrinking quality.

Step 5. (10 minutes)
Have the participants assemble the construction materials.

Step 6. (5 minutes)
Ask the participants to form construction groups.

Step 7. (45 minutes)
Instruct the group to begin working and make earthen blocks using the following procedure:

- Sift the soil and sand through a 3mm to 5mm (1/8" to 3/16") mesh screen.

- Dig a shallow pit to use as a mixing basin.

- Mix soil, sand and water to stiff mud consistency by puddling.

Trainer Notes

Explain here that the blocks should be of varying proportions of soil/sand and some should contain different admixtures such as chopped straw. These different proportions will produce varying results that can be evaluated by the participants as the blocks dry.

- Place a small amount of sand on the ground so blocks won't stick.

- Place the mold over the sand, making sure to wash the inside of the mold after each use.

- Fill the mold, ramming the mixture into all of the corners of the form, leveling the top and noting the soil/sand proportions on the surface of the block.

- Quickly withdraw the mold.
- Repeat the process until at least five blocks have been formed.

Trainer Notes

Circulate throughout the construction groups and offer assistance as needed.

Step 8. (5 minutes)
Reconvene the group and explain that the blocks should be turned on edge to allow for uniform drying in 2 or 3 days.

Trainer Notes

Encourage the groups to return periodically to examine the way in which the blocks are drying. Explain that ideally the blocks will dry completely in about two weeks.

Step 9. (10 minutes)
Have the participants clean up the work area and the tools.

GLOBAL ENERGY ISSUES

Total time: 2 hours

Objectives:

* To examine and discuss the differences in the world's per capita energy consumption

* To identify global energy issues and discuss ways of addressing them

* To compare energy consumption patterns in the U. S. with those of the Third World

* To discuss how this training program addresses some global energy issues

Resources:

* Eckholm, The Other Energy Crisis

* Crabbe and McBride, The World Energy Book

* Katz, Food: Where Nutrition, Politics and Cultures Meet

* Eckholm, Losing Ground

* Attachment I-14-A, "Per Capita Energy Use and GNP"

Materials: Newsprint and felt-tip pens

Trainer Notes

* In order to carry out this session well, it is important that you have a strong awareness of international development issues.

* Spend some time prior to the session reviewing the resource materials. If the participants have had limited international experience, ask them to complete the "Global Energy Questionnaire" in Katz, pp. 151-155 and 187-189 as an additional first step to this session.

* Write the objectives on newsprint before the session.

Step 1. (5 minutes)
Present the objectives and outline the session activities.

Step 2. (15 minutes)
Distribute, review and discuss Attachment I-14-A, "Per Capita Energy Use and GNP."

Trainer Notes

- Encourage participants to comment on the position of the United States on the chart and the position of the countries of the developing world.
- Ask them to identify some of the forms of energy used in the U. S. and in the developing world.
- Have them briefly discuss their consumption of energy here in the U. S. and how they expect it to change when in-country.

Step 3. (15 minutes)
Have the participants brainstorm a list of global energy issues. Encourage questions, comments and discussion.

Trainer Notes

- The list should include: deforestation, erosion, the population explosion, inequitable distribution of resources, political instability, displacement of people, pollution and environmental degradation, squandering of resources, poor balance of payments, etc.
- Write each issue on newsprint as it is stated.
- Ask people to give examples of each issue and try to trace the interrelationship between them.

Step 4. (40 minutes)
Have the participants form small groups and discuss in detail the global energy issues identified in Step 3.

Trainer Notes

Explain that each group should:

- List possible ways of addressing global energy issues.
- Identify ways in which this training program can begin to address them.
- Name a group member to serve as a recorder and write the key points of the discussion on newsprint.
- Identify responses to the issues which may not be covered during this program but could be addressed later in-country.

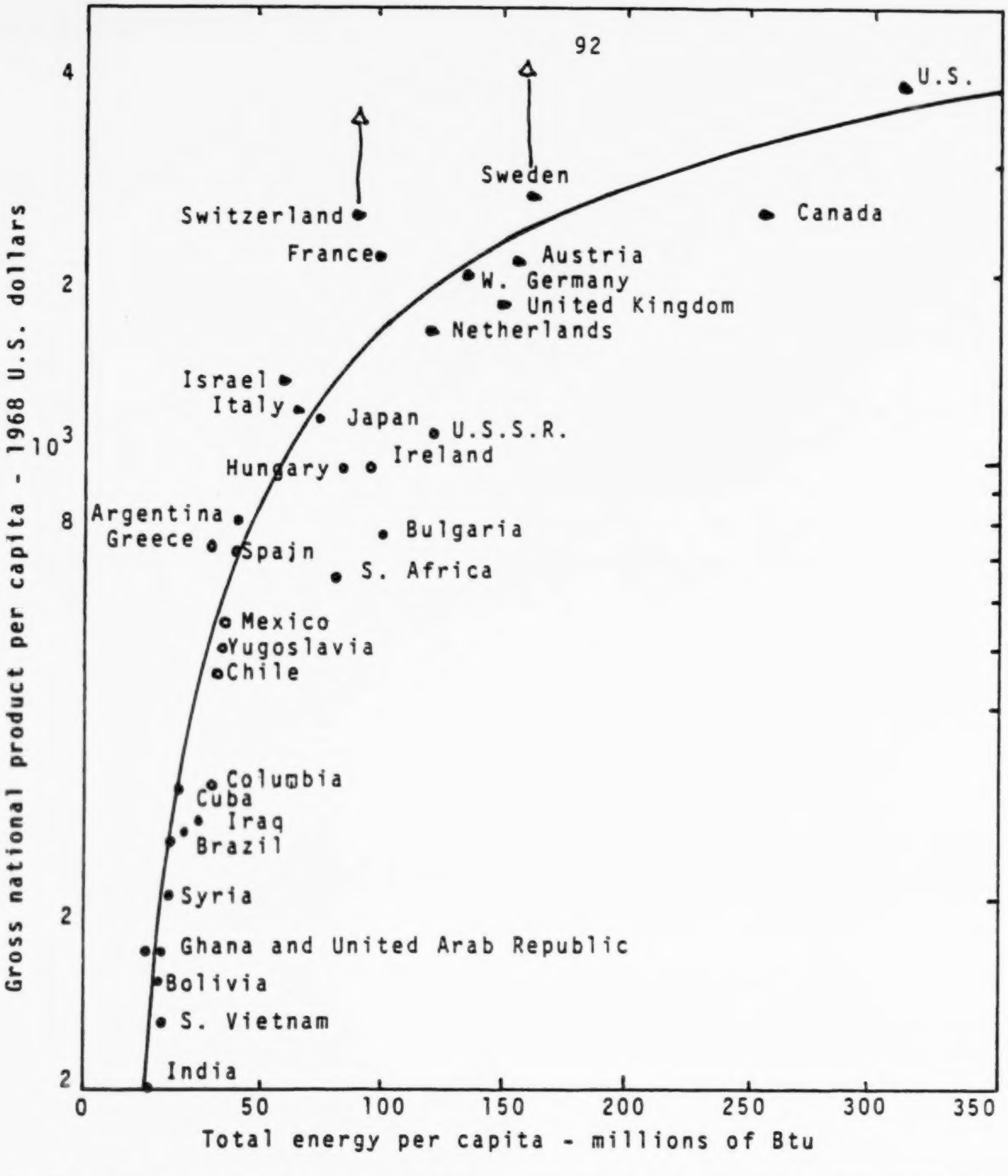
Step 5. (35 minutes)
Reconvene the groups and have them present the results of their discussions.

Trainer Notes

- * Ask the recorders from each group to post and present the points covered in their discussions. After each group has made its presentation, encourage questions, comments and discussion.

- * Clarify, if necessary, which issues will be addressed directly during training (i.e., fuel-saving cookstoves and the fuel wood shortage in the developing world) and which may be addressed in-country.

PER CAPITA ENERGY USE AND GNP *



* Energy per capita versus the gross national product per capita in 1968 for several nations

INTRODUCTION TO THE EVALUATION PROCESS

Total time: 2 hours

Objectives:

- To examine the way in which participants are evaluated during the program
- To identify and clarify criteria that will serve as the basis for evaluating participants during the program and for assessing their readiness and suitability for future Peace Corps service

Resources:

- Attachment I-15-A, "Self Evaluation Sheet"
- Attachment I-15-B, "Trainer Evaluation Form"
- Attachment I-15-C, "Explanatory Notes on the Evaluation and Selection Process"

Materials: Newsprint and felt-tip pens

Trainer Notes

It is important that staff members participate in this session so that decisions concerning the evaluation are mutually understood and accepted by both staff and participants from the start of the program.

Step 1. (10 minutes)
Review the session objectives.

Trainer Notes

Explain that throughout the program each participant will be evaluated based on the knowledge, skills, behavior and attitude that will be important during Peace Corps service. The essence of the evaluation system is that all who take part in the program -- staff and participants alike -- also share in the process of defining and using the criteria for effective Peace Corps work.

Also stress that the evaluation process will emphasise self evaluation on the part of all participants.

Step 2. (20 minutes)
Distribute Attachment I-15-C, "Explanatory Notes on the Evaluation and Selection Process," and allow time for reading and questions.

Trainer Notes

Also included in Attachment I-15-C is an outline of the evaluation process as it occurs throughout training. This may be used as reference material for the trainer or made available to participants as well.

Step 3. (10 minutes)
Distribute Attachment I-15-A, "Self Evaluation Sheet," and Attachment I-15-B, "Trainer Evaluation Form," and review them.

Trainer Notes

Explain that the criteria in each of the four categories have been developed during other training programs and are intended as samples that may be used as guidelines during the next step to help people develop their own criteria or modify the existing ones.

Step 4. (30 minutes)
Have the participants form four groups (one for each major evaluation category: communication, commitment, technical and cognitive) and develop on newsprint a list and explanation of the criteria that they believe are important as a basis for evaluation in that particular category.

Trainer Notes

Each group should include representatives from both staff and trainees to insure that there is active involvement by all who are participating in the training program.

Whether the criteria from the sample form are used, modified or changed, there should be ample time allotted for discussion so that the group can arrive at an agreement about the criteria to be used. It is possible that the group will accept the sample evaluation criteria and all that will be necessary is a review and definition of the terms already listed.

Step 5. (45 minutes)
Reconvene the large group and have a representative from each group post and explain their criteria list.

Trainer Notes

For each major category, the participant explaining his/her group's criteria list should make any necessary modifications, additions or deletions such that the entire group agrees upon the list.

Step 6. (5 minutes)
Explain that the final criteria lists developed in this session will be used by the staff in completing "Trainer Evaluation Forms" and should be used by the participants in completing their "Self Evaluation Sheets" at the end of each evaluation period.

Trainer Notes

The criteria lists should be typed and transferred to the "Self Evaluation Sheets" and the "Trainer Evaluation Forms" before the end of the first evaluation period.

The written explanations for each criteria should be typed separately and distributed to all participants and staff as a reference aid.

SELF EVALUATION SHEET

Name: ______________________ **Phase:** ______________

Criteria/Trainee Comments

Be specific and give examples to support your comments. Provide suggestions for self improvement.

COMMUNICATION SKILLS

- * Active Listening
- * Clarity of Expression/Thought
- * Versatility
- * Feedback
- * Role Flexibility
- * Patience
- * Effective Facilitation

COMMITMENT TO PROGRAM

- * Positive Motivation
- * Enthusiasm
- * Taking Responsibility for Oneself and Program
- * Punctuality
- * Willingness to Change/Adapt
- * Cooperation & Mutual Support
- * Active Participation
- * Self Assessment
- * Sincerity

Name: ______________________________ Phase: ____________________

Criteria/Trainee Comments	Be specific and give examples to support your comments. Provide suggestions for self improvement.

TECHNICAL COMPETENCE

- Resourcefulness
- Processes
- Results
- Understanding
- Transfer of Skills

COGNITIVE SKILLS

- Problem Solving
- Understanding Development Ideas
- Cross-Cultural Awareness
- Application of Experiential Learning
- Awareness of Strengths and Weaknesses
- Observation Skills
- Organizational Skills

TRAINER EVALUATION FORM ATTACHMENT I-15-B - Page 1

Name: ______________________________ Phase: ____________________

Criteria/Staff Comments	Be specific and give examples to support your comments. Provide suggestions for improvement.

COMMUNICATION SKILLS

- Active Listening ____________________
- Clarity of Expression/Thought ____________________
- Versatility ____________________
- Feedback ____________________
- Role Flexibility ____________________
- Patience ____________________
- Effective Facilitation ____________________

COMMITMENT TO PROGRAM

- Positive Motivation ____________________
- Enthusiasm ____________________
- Taking Responsibility for Oneself and Program ____________________
- Punctuality ____________________
- Willingness to Change/Adapt ____________________
- Cooperation and Mutual Support ____________________
- Active Participation ____________________
- Self Assessment ____________________
- Sincerity ____________________

TRAINER EVALUATION FORM ATTACHMENT I-15-B - Page 2

Name: ______________________ Phase: ______________

Criteria/Staff Comments	Be specific and give examples to support your comments. Provide suggestions for improvement.

TECHNICAL COMPETENCE

* Resourcefulness

____

* Processes

____

* Results

____

* Understanding

____

* Transfer of Skills

____

COGNITIVE SKILLS

* Problem Solving

____

* Understanding Development Issues

____

* Cross-Cultural Awareness

____

* Application of Experiential Learning

____

* Awareness of Strengths and Weaknesses

____

* Observation Skills

____

* Organizational Skills

____

EXPLANATORY NOTES ON THE EVALUATION AND SELECTION PROCESS

The essence of this program is to help you develop the skills and knowledge that will be necessary during Peace Corps service. For this reason we emphasize the importance of on-going evaluation. Such evaluation is essential to making any recommendation about your readiness and suitability for Peace Corps service.

Remember: you are not yet a Peace Corps Volunteer and it is your participation in this program that will help you and the training staff determine whether or not Peace Corps is the right direction for you at this time. We encourage you to take an active role in the process: from identifying the criteria that will be used to evaluate you, to taking part in the evaluation of your knowledge, skills, attitudes and characteristics that are relevant to future Peace Corps service.

The evaluation process includes a number of steps and is intended to provide staff and trainees with some tools for examining your growth and readiness. The decision to leave the program can be made at any point during training, either by you or by the training staff. Any decision of this kind should be mutual and based on an honest, open self appraisal.

The format and implementation plan of this evaluation and selection process consists of the following:

A. Skills and Knowledge Assessment Sheet

   1. Purpose
      To provide you and the training staff with an understanding of the skills and knowledge you bring to the program

   2. Implementation
      To be distributed and completed during the first week of the program

B. Introduction to Training Manual and Training Goals

   1. Purpose
      To provide you with an understanding of the goals and methodology of the training program

   2. Implementation
      To be distributed and explained during the first week of the program

C. Training Expectation List

1. Purpose
   To enable you to clarify your expectations regarding the training program and to enable the training staff to clarify its expectations

2. Implementation
   To be developed in a structured activity during the first week of the program

D. Peace Corps Service Expectation List

1. Purpose
   To enable you to clarify your expectations regarding Peace Corps service as a volunteer

2. Implementation
   To be developed in a structured activity during the second week of the program

E. Trainee Evaluation Criteria

1. Purpose
   To provide you and the training staff with a basis for assessing your ability to acquire the skills necessary for successful Peace Corps service

2. Implementation
   To be carried out through the use of the following multiple techniques and indicators:

   a. Trainer Evaluation Forms
      To include trainee evaluation criteria lists. They are designed to be completed by the training staff at the end of each phase of training

   b. Self Evaluation Forms
      To include the same components as the Phase Evaluation Forms and to be completed by you at the end of each phase of training

F. Counterpart Sessions

1. Purpose
   To provide you and the training staff with the opportunity to share perceptions of your progress regarding levels of skills acquisition and to discuss strengths and weaknesses in a mutually supportive and constructive environment

2. Implementation
   To be conducted at the end of each phase of the program on a one-to-one trainee/staff basis with completed Trainer Evaluation Forms and Self Evaluation Sheets serving as a basis for discussion

G. Final Written Statement of the Role of Volunteer in Development

1. Purpose
   To provide you and the training staff with a final written statement of your perceptions of your role as a Peace Corps volunteer

2. Implementation
   To be completed during Phase VI of the training program

H. Final Skills and Knowledge Assessment Sheet

1. Purpose
   To provide you and the training staff with an understanding of any new skills and knowledge you acquired during the training program

2. Implementation
   To be distributed and completed during Phase VI of the training program

J. Final Interview

1. Purpose
   Based on the culmination of all completed evaluation techniques and indicators, to provide you and the training staff the opportunity to discuss your over-all readiness and suitability for Peace Corps service and to arrive at a final, mutually-negotiated decision regarding your invitation for Peace Corps service

2. Implementation
   To be conducted during the final week of training

K. Final Written Recommendation

1. Purpose
   To provide you, the training staff and Peace Corps with a final written statement of your level of skills development and an over-all recommendation regarding your invitation to enter Peace Corps service

2. Implementation
   To be completed and negotiated mutually during final interviews

PHASE I	PHASE II	PHASE III	PHASE IV	PHASE V	PHASE VI
Introduce the evaluation process Complete Skills and Knowledge Assessment Sheets Introduce the training manual and program goals Identify expectations of training program Develop trainee evaluation using Trainer Evaluation Forms and Self Evaluation Sheets Conduct counterpart Sessions to discuss written evaluations	Develop expectation list for Peace Corps service Develop written evaluation using Trainer Evaluation Forms and Self Evaluation Sheets Conduct counterpart sessions to discuss written evaluations	Develop written trainee evaluations using Trainer Evaluation Forms and Self Evaluation Sheets Conduct counterpart sessions to discuss written evaluations	Develop written trainee evaluations using Trainer Evaluation Forms and Self Evaluation Sheets Conduct counterpart sessions to discuss written evaluations	Develop written trainee evaluations. using Trainer Evaluation Forms and Self Evaluation Sheets Conduct counterpart sessions to discuss written evaluations	Complete final written statement of the role of the volunteer in development Complete Final Skills and Knowledge Assessment Sheets Conduct final interviews to review all evaluations and discuss final invitation to Peace Corps service Complete final written recommendation stating over-all levels of skills development and final invitation to Peace Corps service

NOTE: It is important to consistently carry out all the components of the trainee evaluation process in an ongoing fashion throughout the program. This brief schematic outline indicates the major components of the process as they should occur in each phase.

EVALUATION AND INTEGRATION OF TRAINING THEMES
PART ONE: THE PHASE EVALUATION QUESTIONNAIRE

Total time: 30 minutes

Objectives:
- To evaluate the effectiveness of the past phase of training
- To give feedback to the staff about the program to date

Resources: Attachment I-16/1, "Phase Evaluation Questionnaire"

Trainer Notes

Before the session, prepare and post on newsprint:

* A chronological list of sessions from the phase being evaluated
* A list of trainers who participated in the phase

Procedures: Step 1. (5 minutes)
Introduce the evaluation process, post the list of sessions and distribute the evaluation questionnaire.

Trainer Notes

Explain that the questionnaire will be used throughout training. It provides an opportunity for people to communicate their thoughts about the effectiveness of sessions and of the training staff and to make suggestions for improvement.

Point out that participants need not sign their names to the questionnaires.

Step 2. (10 minutes)
Have participants complete Part I of the questionnaire, using the list of sessions as a guide.

Step 3. (10 minutes)
Have participants complete Part II of the questionnaire, using the list of trainers as a guide.

Step 4. (5 minutes)
Collect the completed questionnaires and explain how they will be used.

Trainer Notes

Emphasize that this evaluation process will be repeated at the conclusion of each phase of the training. Let the participants know the information provided by the questionnaires will be used by the staff to modify and improve the training program.

PHASE EVALUATION QUESTIONNAIRE

This questionnaire provides us with ongoing information we can use to increase the effectiveness of the training. We would appreciate your thoughtful consideration in making specific comments to tell us why an activity was useful or why it was not as useful as it might have been.

Part I: Sessions

List training activities in the order indicated by your instructor. Next rate their usefulness by circling a number on the scale.

Session Title	Not Useful		Moderately Useful		Very Useful
1. ______________________	1	2	3	4	5
Comments:					
2. ______________________	1	2	3	4	5
Comments:					
3. ______________________	1	2	3	4	5
Comments:					
4. ______________________	1	2	3	4	5
Comments:					
5. ______________________	1	2	3	4	5
Comments:					
6. ______________________	1	2	3	4	5
Comments:					
7. ______________________	1	2	3	4	5
Comments:					
8. ______________________	1	2	3	4	5
Comments:					

ATTACHMENT I-16/1 - Page 2

Session Title	Not Useful		Moderately Useful		Very Useful
9. ______________________	1	2	3	4	5
Comments:					
10. ______________________	1	2	3	4	5
Comments:					
11. ______________________	1	2	3	4	5
Comments:					
12. ______________________	1	2	3	4	5
Comments:					
13. ______________________	1	2	3	4	5
Comments:					
14. ______________________	1	2	3	4	5
Comments:					
15. ______________________	1	2	3	4	5
Comments:					
16. ______________________	1	2	3	4	5
Comments:					
17. ______________________	1	2	3	4	5
Comments:					
18. ______________________	1	2	3	4	5
Comments:					
19. ______________________	1	2	3	4	5
Comments:					
20. ______________________	1	2	3	4	5
Comments:					

Part II: Trainers

List the name(s) of your major trainer(s) in the blanks provided and comment on the overall effectiveness during this week. Use the following points for consideration:

- Ability to effectively communicate information
- Apparent knowledge of subject matter
- Ability to integrate the major components of training, e.g., technical, health and nutrition, women in development, extension, cross-cultural and role of volunteer in development
- Methodology (flexibility, adult learning principles, etc.)

Name: ______________________ Comments: ________________

Name: ______________________ Comments: ________________

Name: ______________________ Comments: ________________

Name: ______________________ Comments: ________________

Name: ______________________ Comments: ________________

Name: ______________________ Comments: ________________

Name: ______________________ Comments: ________________

Part III: Participation

Do you feel that you have participated in the discussions to the extent that you wanted? ( ) Yes ( ) No

Do you feel that other participants have had an equal opportunity to contribute to the discussions? ( ) Yes ( ) No

Comments: ______________________________

____

____

____

Reflect on this week and pick out the three most important things you have learned (such as a particular content, an insight, an interaction, a process, something shared, etc.) and write them in the blanks provided.

1. ______________________________

____

2. ______________________________

____

3. ______________________________

____

List any difficulties or problems with the training to date and suggest how they might be corrected.

____

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EVALUATION AND INTEGRATION OF TRAINING THEMES
PART TWO: EXAMINATION OF TRAINING THEMES

Total time: 30 minutes

Objectives:

* To identify and discuss the major themes of the training program

* To examine how the themes of the program are related to one another

Resources: Chronological list of sessions from the past phase (see Part One of this session)

Materials: Newsprint and felt-tip pens in different colors

Procedures: Step 1. (10 minutes)
Refer to the posted list of sessions and ask the participants to identify the major themes of training. Record their responses on newsprint.

Trainer Notes

If necessary, provide an example or two of the training themes that appear in the introduction to this manual.

Step 2. (10 minutes)
Have the participants form groups of 4 or 5 and, on newsprint, develop a visual representation of the way the training themes relate to one another.

Trainer Notes

Encourage the groups to make their representation as detailed and creative as possible. If necessary, provide an example.

Step 3. (10 minutes)
Have the groups reconvene and present and discuss their visual representations.

Trainer Notes

Some questions for discussion include:

* Is there a need for more technical training at this time?
* Why is a health and nutrition component included in training?
* What importance do facilitation and communication skills have in this program and during Peace Corps service?
* How is this program similar to or different from your expectation?

EVALUATION AND INTEGRATION OF TRAINING THEMES
PART THREE: THE FISHBOWL -- AN EXERCISE IN COMMUNICATION

Total time: 1 hour

Objectives:

* To establish open and positive communication among training staff and participants

* To practice giving and receiving feedback

Materials: Newsprint and felt-tip pens

Trainer Notes

We suggest that one of the trainees facilitate this session. It is a good opportunity to encourage active participation and to demonstrate staff willingness to "let go" and be receptive to feedback.

Procedures:

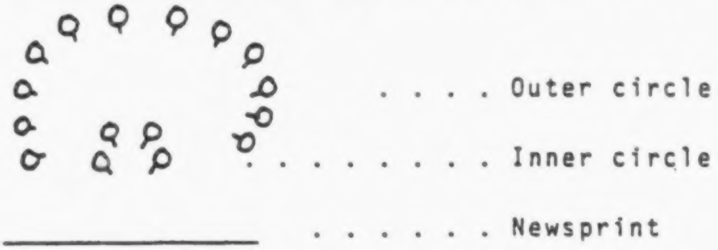
Step 1. (5 minutes)
Review and explain the session objectives.

Step 2. (15 minutes)
Have people form groups of 4 or 5 and:
* Record on newsprint three criticisms of the program and, for each criticism, a specific suggestion as to how the program could be altered to address it.
* Post the criticisms and suggestions.

Trainer Notes

It is important that the entire training staff participate in this activity. Each small group should include at least one staff member.

While the small groups are working, arrange chairs in a semicircle at the front of the room so that four people can face and speak to one another while reading the posted criticisms and suggestions. Arrange a second row of chairs around the first four. The configuration should look like this:



Step 3. (10 minutes)
Have the group reconvene and occupy the chairs in the outer semi-circle. Explain the "Fishbowl" activity.

Trainer Notes

Ask if anyone has had experience with this activity. If so, ask them to help you with the explanation. Your explanation should include the following points:

* Only four people at a time will be in the inner semi-circle.
* The role of each of the four people will be to discuss and respond to the posted criticisms and examine the feasibility of the suggestions.
* The role of those in the outer semi-circle will be to observe.
* When someone from the outer circle wants to enter the discussion, a person from the discussion group should leave and join the observers.

The reason for using the fishbowl structure is to provide a comfortable format for discussion and to encourage constructive feedback and suggestions. Therefore, it is important that people feel free to express their thoughts without fear of reprisal. People should be encouraged to enter the discussion and to exchange places with one another when they have something to say. It is a good idea to have at least one member of the training staff in the discussion group at all times.

Step 4. (25 minutes)
Ask that four volunteers move to the inner semi-circle and initiate the activity by responding to one of the criticisms.

Step 5. (5 minutes)
Summarize the criticisms and suggestions that have resulted from this activity, and explain that the fishbowl format may be used at any time during training,whenever people feel it is necessary to discuss issues, clear the air or evaluate some aspect of the program.

Trainer Notes

Procedural Note:

The process of participant evaluation and assessment of the training program consists of a series of integrated activities which occur throughout the program. This session outlines the evaluation activities recommended for Phase I. It also

Continued

Trainer Notes

identifies those activities which should occur at the end of each subsequent phase (i.e., the evaluation questionnaires and the optional fishbowl activity). Other recommended program evaluation activities are outlined in Phase III, "Mid-Program Evaluation," and Phase VI, "Final Program Evaluation" and "Energy Fair Evaluation." In order to insure effective on-going program evaluation, it is important to be consistent and use the recommended activities at the end of each phase.

The outline on the following page is designed to help you remember the program evaluation activities which should occur in each phase of the program.

OUTLINE OF PROGRAM EVALUATION ACTIVITIES

PHASE I	PHASE II	PHASE III	PHASE IV	PHASE V	PHASE VI
Presentation of Phase Evaluation Questionnaire Develop training expectation lists Integration of training themes Feedback and discussion/ fishbowl exercise	Phase Evaluation Questionnaire Fishbowl exercise (optional)	Phase Evaluation Questionnaire Mid-Program Evaluation: Review and assess expectation lists Complete Mid-Cycle and Final Evaluation of Training Goals forms Fishbowl exercise (optional) Assessment of group dynamics: Coat of Arms activity	Phase Evalution Questionnaire Fishbowl exercise (optional)	Phase Evaluation Questionnaire Fishbowl exercise (optional)	Final Program Evaluation: Mid-Cycle and Final Evaluation of Training Goals forms (PCT facilitator) Energy Fair Evaluation: Success Indicator Lists (PCT facilitator)

PHASE II: EARTHEN CONSTRUCTION AND FUEL-SAVING COOKSTOVES

Health and Nutrition

The Role of the Volunteer in Development

PHASE II CALENDAR - Page 1

	DAY 1	DAY 2	DAY 3
A.M.	SESSION 1: Environmental Health and Sanitation (Skill Area II) SESSION 2: Traditional Methods of Cooking: An Introduction to Cookstove Technologies (I)	SESSION 5: Thinking in Pictures: Introduction to Design Drawing (IV) SESSION 6: Introduction to Independent Study (II)	SESSION 9: Insolation Meter Construction (III) SESSION 10: Cookstove Construction, Parts 1, 2 and 3 (IV)
P.M.	SESSION 3: Fuel-Saving Cookstoves: Gathering Information (I) SESSION 4: Cookstove Design and Innovation (II)	SESSION 7: Cookstove Operation, Function and Design Principle (IV) SESSION 8: Understanding the Cookstove Design Process and Soil Mixes (II & III)	Cookstove Construction (continued)

	DAY 4	DAY 5	DAY 6
A.M.	Cookstove Construction (continued)	SESSION 13: The Role of the Volunteer in Development: Definition of Appropriate Technology (II) SESSION 14: Stove Promotion and Dissemination (IV & V)	SESSION 17: Diagnosing and Repairing Malfunctioning Cookstoves, Parts 1 & 2 (IV & V) SESSION 18: Other Responses to Fuel Scarcity (I) SESSION 19: Charcoal Production and Cookstoves (IV)
P.M.	SESSION 11: Nature of Volunteerism: Expectations Beyond Training (I & II) SESSION 12: Food Issues (I)	Independent Study SESSION 15: Explaining Completed Cookstoves (V) SESSION 16: Evaluating Cookstove Efficiency (V)	

	DAY 7	DAY 8	DAY 9
A.M.	SESSION 20: Custom and Food (I & II) SESSION 21: Design and Construction of the Second Cookstove Parts 1, 2 and 3 (II & IV)	SESSION 22: Alternative Cookstoves: Presentations (IV & V) SESSION 23: Basic Nutrition (I & II) SESSION 24: Cookstove Operation Parts 1 & 2 (II & IV)	SESSION 25: Cookstove Development and Innovation (I & II) SESSION 26: Cookstove Information, Resources and Evaluating Cookstove Training (V)
P.M.	Construction of the Second Cookstove (continued)	Cookstove Operation (continued)	

ENVIRONMENTAL HEALTH AND SANITATION

Total time: 2 hours

Objectives:

- To identify causes of illnesses and their means of transmission
- To discuss common tropical diseases and methods for prevention, control and eradication
- To discuss ways in which appropriate technologies may address problems of sanitation and disease

Resources:

- Werner, Where There Is No Doctor, pp. 17-19, 131-178
- Werner and Bower, Helping Health Workers Learn
- Attachment II-1-A, "Sanitation in Nepal"
- Attachment II-1-B, "Hygiene Information Packet"
- Attachment II-1-C, "Causes of Infectious Disease"
- Attachment II-1-D, "Antibody Creation"
- Attachment II-1-E, "List of Diseases and Their Geographical Areas of Endemicity"
- Attachment II-1-F, "Competency Assessment/ Study Guide"

Materials: Newsprint and felt-tip pens and/or chalkboard/ chalk; visual aids (photos/slides/drawings/ films) See Trainer Notes.

Trainer Notes

This session will require a great deal of preparation. If you don't feel qualified to discuss medical aspects of this session, it would be helpful to invite a health practitioner to speak.

Procedures:

Step 1. (5 minutes)
Review the session objectives and outline the activities.

Step 2. (20 minutes)
Present a film, a slide show or other visual aid to illustrate the current problems of sanitation and disease in developing countries.

Trainer Notes

To set a context for discussion, it is very effective to use visual aids (a film, photographs, drawings) that depict daily life in developing countries and the health and sanitation problems which exist.

Refer to Werner & Bower for resources to develop visual aids.

Step 3. (10 minutes)
Have the participants brainstorm a list of factors in the environment that cause illnesses.

Trainer Notes

The list should include: disease vectors, customs and habits, climate and geography, economic status, education, industrial pollutions, contaminated water, air, soil.

Step 4. (30 minutes)
Distribute Attachment II-1-A, "Sanitation in Nepal," and Attachment II-1-B, "Hygiene Information Packet," and assign Werner, pages 17-19 and 131-148. Give participants time to read the materials.

Trainer Notes

This is an excellent time to mention Werner's book as a valuable self-help resource.

Step 5. (20 minutes)
Distribute Attachments II-1-C and -D, "Causes of Infectious Disease" and "Antibody Creation," and give a brief talk on the causes of transmission of diseases. Invite comments and questions.

Step 6. (20 minutes)
Distribute, review and discuss Attachment II-1-E, "List of Major Diseases and Their Geographical Areas of Endemicity,"

Trainer Notes

Identify modes of transmission, causes, prevention measures and general treatments for the major diseases listed. Elicit information from the group. Post the information on the chalkboard or newsprint.

Step 7. (20 minutes)
Have the participants discuss their ideas on ways hygiene can be improved to help prevent disease.

Step 8. (5 minutes)
Assign and explain Attachment II-1-F, "Competency Assessment/Study Guide."

Trainer Notes

* Refer participants to Werner, pages 150-244, for additional reading on common illnesses.

* Explain that the "Competency Assessment/Study Guide" should be completed and turned in at the mid-program evaluation.

SANITATION IN NEPAL

By Broughton Coburn

Introduction

This paper will discuss many aspects of sanitation in Nepal, with special emphasis on the cultural, technological and institutional impediments to its widespread improvement. Institutional avenues for implementing appropriate sanitation technologies and their costs are explored.

Improved sanitation facilities are virtually non-existent in Nepal at present. The people are strong and, in general, sufficiently nourished, but gastro-intestinal ailments caused by pathogens spread by the poor and deteriorating sanitation are having a visibly damaging effect on the health of the population. Infectious skin disease is common, infant mortality is high and the likelihood of epidemics is real, all exacerbated by Nepal's poor sanitation. The Government of Nepal's drinking water supply program for rural areas currently has no sanitation component, but attempts have been made to combine the two in the past. Sanitation improvement demands a change in habits and lifestyle with no tangible return, and will be especially slow and difficult since the subject is embarrassing for most. Development projects such as roads or hospitals are often felt to be an addition to, if not extraneous to, the lifestyle of most, and require little sacrifice on the villager's part. Apathy fostered by a lack of recognition of the causal link between sanitation and health, in all levels of Nepalese society, are the primary stumbling blocks to the development of a self-perpetuating sanitation program.

The failure (at least 50%) and inadequacy of the improved sanitary installations that have been built in Nepal to date (primarily in the Kathmandu Valley) has been due to four major downfalls:

1. Inappropriate design and location, where the habits and desires of the local people have been given little consideration

2. Insufficient water supply

3. Erratic or non-existent maintenance

4. Lack of community participation and commitment to its construction and operation

In spite of the medieval picture of Nepal's sanitation, there are distinct possibilities for correcting each of these downfalls, and they are discussed in detail below.

TRADITIONAL SANITATION

The Terai and Hills

Shortly before sunrise on any morning, the bulk of the Terai and hills populace can be found squatting near creekbeds, field margins or trailsides performing an almost ritualized event: the daily elimination. The vast majority have their elimination before sunrise or shortly afterward. Few have shifted their pattern to the evening after dark, and elimination during the daytime is uncommon. The explanation for such a universal routine schedule is apparent: it is the most convenient time of day, there is more privacy, due to the darkness, and their eating habits consist of two large and identical meals consumed at the same times each day, allowing routine defecation habits to develop. Indeed, each villager's defecation patterns are interrupted only by sickness or a radical diet change. Some have confided to this author that they will go out to defecate in the morning regardless if they have the urge to. Just as a break in eating habits is considered to be a symptom of illness, a break in the daily elimination routine is likewise suspicious.

It is interesting that in some villages with distinct communal areas of defecation, the women will develop a pattern of defecating in the evening, while in the morning only the men will visit that area. Regardless of whether they defecate in the morning or the evening, in each neighborhood or village the women tend to synchronize. The opportunity for socializing, often not possible at other times, should not be overlooked as a reason for this. In some villages, the defecation areas are segregated by sex. None of these observed patterns are arranged or verbalized in any way by the villagers -- defecation is generally an embarrassing topic.

River banks and creekbeds are the most popular defecation sites, because water is the cleaning agent of preference. The usual custom is to squat within ten meters of the flowing water source, walk over and then actually stand in the water while cleaning with the left hand (eating is done only with the right hand, and it is considered unpropitious to accept anything proffered by someone's left hand). It is not hard to imagine how gastro-intestinal pathogens are transmitted to the villagers downstream who depend on the same water source for drinking.

Where flowing water is not readily accessible, a villager will take a small rounded brass or aluminum pot (N. lota) or tin can holding no more than one liter, to a trail or field margin or unutilized area within the village. It is doubtful that effective cleaning of the left hand after wiping is achieved with one liter of water. The lota serves no other household purpose, except in some poorer houses where it may be rinsed and used for drinking. Soap is used only sporadically for hand washing upon return to the residence. Stones and corncobs are less frequently used for cleaning, though corncobs are the parent's agent of preference for small children. When children defecate on the verandah or activity area in front of the house, dogs (usually unowned scavengers) and chickens are called to consume the mess. Dogs consume significant, but unknown amounts of fresh feces. Sometimes they are also allowed to lick the villager's meal plates after eating and subsequent utensil washing is of questionable value. Chickens are perhaps the greater agents of disease transmission, as they frequently commute between the defecation areas and the residence, and contaminate the food of small children eating from bowls on the floor. Chickens are cooped only at night.

The Effect of Poor Sanitation on Health

Only the most sheltered short-term visitor can hope to avoid the ubiquitous gastro-intestinal pathogens. Among Nepalese, the fecal-borne pathogens most commonly responsible for illness and loss of working productivity are amoeba (Entamoeba histolytica), roundworm (Ascaris lumbricoides), giardiasis, salmonella spp. and other parasites such as hookworm and pinworm. A pathogenic variety of E. coli has been implicated in some cases of gastro-intestinal distress.

The concept of microscopic pathogens carried long distances in apparently clean water and affecting human health is not well understood by most Nepalese. Water purity is gauged by its clarity and occasionally by superstition or traditonal belief concerning its reported properties. For example, the hex that certain evil spirits have purportedly cast upon some water sources is often the explanation for clear, but contaminated water. Some citizens of a village in Syangja District in Central Nepal believe that a pregnant woman will risk having twins or triplets if she drinks from a certain nearby spring. In spite of the fact that many educated people notice flies breeding in fetid places and also landing on food, they make no connection between this and gastro-intestinal distress.

Impediments to Change

Understandably, Nepalese regard feces with extreme revulsion, but this is almost ironic in light of their casual treatment of it, its prevalence on the waysides, and the religious respect and usefulness that they attribute to cattle manure. Defecating in agricultural fields, regardless of whether they are cultivated or fallow, is a transgression worthy of reprimand to the offender. Most Nepalese firmly retain the notion that it is improper and unsanitary to defecate in the same place every day. They say that this is the habit solely of the weasel, considered to be a particularly unhygienic animal. People who do build latrines and use them (foreigners and the educated, for instance) are often ridiculed and compared to this animal. But their aversion to defecate in a common place is further based on common sense and their experience with "latrines," usually naturally-occurring open, low places below a flat rock, which are occasionally used by villagers: dogs will not visit these areas, so some may feel that the dogs might go "undernourished" while the waste subsequently goes uncollected. An offensive smell issues from these pits, a problem, by comparison, of only the most heavily-visited waste areas, and fly breeding in these common pits is also more noticeable than in the "defecation areas."

The greatest single reason that villagers are averse to using pit latrines other than that of "tradition" or "habit," is that most Nepalese would like to see the nature of the produced stool, and they look specifically for worms (primarily Ascaris). This is not possible with most pit latrine designs, and is the greatest cause of ultimate abandon of latrines: villagers go out to use the latrine, and then deposit the stool on the side of the hole or on the footpad. Out of revulsion, the next visitor stands a foot or two further away, and so on until a trail of excrement leads away from the latrine.

Their reaction to the idea of reusing human waste as fertilizer is also one of revulsion, regardless of its state of decomposition. Educated villagers realize, however, that this belief is unwarranted and that people of other countries reuse their night soil.

Not surprisingly, one of the stronger impressions of Nepal that is left with trekkers and tourists is that of the atrocious sanitation and the total dearth of facilities. In Kathmandu, it is bothersome to observe where one is stepping every moment, and it is a source of inconvenience for tourists to return to their hotels by taxi to use the facilities. Trekkers have further difficulties in the mountains. The relatively dense population of rural areas allows the trekker little privacy even after he has hiked for several minutes away from a village or neighborhood. Stories of trekkers being chased out of villagers' fields are not uncommon. The litter of toilet paper localized along some popular trek routes is further displeasing to all. Of greater importance, Nepal's poor sanitation has earned it the distinction of being, health-wise, one of the most hazardous countries for tourists in the world.

The Newars of the Kathmandu Valley, the Sherpas of Solu-Khumbu, the Gurungs of Manang, some of the hill tribespeople and many of the educated populace of Nepal have little innate aversion to the use of latrines, but these groups comprise only ten percent of the population. They can be considered exceptions to the norm of the hills and Terai, and are covered separately here.

The Newars of the Kathmandu Valley

The Newars (over 250,000 population in the Kathmandu Valley) reside predominately in dense, urban-like towns and villages. The sanitation of these settlements is as medieval as the architecture and lifestyle. Raw sewage flows down open troughs in every path and alley, where it mixes with slaughter waste and solid garbage thrown from upper windows. Children to the age of four or five simply squat on the path or over the sewer trough, while adults use open areas or back alleyways, inevitably throughways for others. They figure that if they as individuals were to take responsibility for their own waste, their neighbors would befoul the environment anyway.

Besides, the Newars are divided into clans and sub-clans (similar to the Hindu caste system) with a street-sweeping and septic-tank-cleaning clan of untouchables (*Pode*) whose inherited occupation is the removal of wastes. Some of the *Pode* are employed on contract by the wealthy, usually high-level government officials, to clean their septic tanks (which are seldom built correctly) or empty their septic vaults. Septic vaults are common in central Kathmandu city, and are being included more often in urban new-building construction, and among a less wealthy sector. The *Pode* men who clean the vaults have been known to virtually submerge themselves in their medium, for a wage not exceeding Rs. 15/- NC (US $1.20) per day. Many of the *Podes*, primarily the women, are employed by the *Gaou Panchayats* or *Nagar Panchayats* (village or town councils) to clean the main streets and pathways and are paid Rs. 6/- ($0.50) per 6-hour day. Their yokes and hanging baskets (N. *karpanna*) into which waste is scooped with the rib bones of a water buffalo, are a common sight in Newar bazaar towns.

The street and septic wastes collected by the Pode are carried to common "town compost" depots at the edge of town. Here they are piled into heaps growing no larger than $1m^3$. They are removed once annually, again on a contract basis, to the fields of the farming clan of Newars (Jhyapu). Some aerobic fermentation does take place within these compost piles, as steam can be seen rising from them on cold winter mornings. They are not scientifically managed, however.

The Jhyapus have no aversion to using this town compost on their rice paddy and wheat and millet fields, and some farmers have the Podes apply the liquid septic vault wastes directly. They have no taboos concerning defecation on fallow agricultural land, probably because there are few other marginal lands suitable for that purpose. Also, they are not reluctant to use latrines, but the majority have not constructed them for the following reasons:

1. They can't afford to sacrifice the land necessary to build a latrine.
2. If they did build an outdoor latrine, someone else would foul it or otherwise misuse it.
3. Indoor bottom-floor water-seal vault latrines are too expensive.

The Sherpas of Solu-Khumbu and the Gurungs of Manang

The Sherpas, in the Mount Sagarmatha (Everest) area particularly, have for many years constructed unscientific but effective aerobic-compost latrines. The wood floor of the latrine is built 1/2 to 2 meters off the ground, or occasionally attached as an outdoor "bathroom" to a second-story doorway. The waste drops to ground level and piles up until it is removed and spread on the fields before spring plowing. The sides of the latrine between the ground and the floor level are often contained by wooden or bamboo slats (often spaced, occasionally tight-fitting) on at least three sides. Dried leaves and pine needles are heaped in a corner of the latrine floor for cleaning after defecation, and are mixed with the latrine waste to make it a "better fertilizer." A significant proportion of the dried weight of this latrine compost fertilizer consists of leaves and needles. Fly-breeding is controlled in the darker latrines, but not completely. In spite of their recognition of the value of this waste product, not all of the Sherpas from this area use latrines. The cost for one latrine unit, were the materials and labor to be purchased, is similar to that for the pit latrine.

The Gurungs of Manang District also build, though less frequently than their ethnic relatives, the Sherpas, crude aerobic compost latrines of similar design. They have further developed stone outhouses with biscuit-tin roofs and hinged wooden doors, perched over the cliffs that border many of the villages. The waste is not collected from these outhouses, but disposal is effectively achieved. Labor and materials from their construction are usually donated as a part of community work projects (shramdaan), organized by the elected village leaders.

IMPROVED INSTALLATIONS AND CURRENT PROGRAMS

Unfortunately, few public sanitation facilities built with developmental aid or by local development groups have been successful. The chief cause of this is summarized by the downfalls listed in the introduction, further combined with caste prohibitions and inhibitions to change. The ultimate blame for these faults would seem to lie simply with a lack of community commitment and participation, but this is not universally so, and the attachment of blame is often complex. Many communities have the consensus and commitment to improve their sanitation, but are poorly organized to manage the implementation of a project such as a community latrine. Who will supply the capital, who will use the latrines, who will maintain them, where will they be built, etc., are all questions that seldom come up in a traditional village context (but when they do, often end in chronic feuding) -- questions that these communities must primarily address. From the experience so far gained with installed sanitation systems, it appears that the lack of permanent accommodation for recurrent cost financing has been the biggest hindrance to their long-term success, even when it is but a fraction of the capital cost. To bypass this and other organizational problems, it is necessary to shorten the communication gap between central governing bodies (Zone and District Development Offices and village/town Panchayats) and the individual wards and citizens. "Getting lost in the shuffle" is a common fate for small decentralized projects, and it could similarly afflict rural sanitation programming.

Examples are briefly given below of some improved sanitation installations in Nepal, with suggestions of how some of their problems could have been diverted.

Ratna Park latrines:

(Kathmandu, NE and SW corners of the Tundikhel). Nepal's pilot community latrines, built and maintained by the Kathmandu Nagar Panchayat, they are cement trough-style septic tank (and drainage field?) systems. Water is sporadic and insufficient, but the units are tolerably maintained by the streetsweepers, probably because of public outcry (letters in *The Rising Nepal*, etc.) over their tendency to deteriorate, and the pervasive smell of urine within a 20-meter radius of the units. Each complex is used by over 800 persons/day, and probably the same number urinate in the immediate vicinity regardless of the uncrowded conditions within the latrines.

Vishnumati River latrines:

(Across from Bhimsenthan, Kathmandu). These are two simple cement outhouses about 30 meters from the river, fouled and unused. They are of inadequate design and have insufficient water supply, no maintenance, etc.

Bhaktapur Central Sewage System:

(Bhaktapur District, Bagmati Zone) Part of the Bhaktapur development and temple restoration project sponsored by the Government of Germany. Over 60 public latrines of brick and cement have been built in one sector of the city, and over 100 private-home (indoor, bottom-floor) latrines have been installed for a token fee ($8.00). The improvement is remarkable: The casual impression is that an unbearable place has been transformed into an enchanting village of cleanliness seen only in Europe. The latrines are popular, but the water taps (1 for every 2-6 latrines) supply water inconsistently, since they are connected directly to the central water system, which is frequently shut off. The latrine wastes fall directly into flowing water, travel underground and empty into an oxidation pond at the end of town. No plan was made for reuse of the treated waste.

Women's Community Latrine Bio-gas System:

(Tyaagal Tole, Ward #7, Patan, Lalitpur Nagar Panchayat) Funded through U.S.A.I.D. and Peace Corps and the Division of Soil Science and Agricultural Chemistry of the Agriculture Department of the Government of Nepal. An 18-hole women's latrine complex was completed early in 1976, and now handles 4-800 women/day. It is crowded (waiting lines) from 3:30 a.m. to 7:00 a.m. Water supplied to the complex is sufficient but not plentiful. Wash water alone used in the latrines is not adequate to affect proper flow of wastes -- the janitor must flush the wastes with excess water, twice per day.

This community latrine and the Bhaktapur latrine system are among the most successful community sanitation schemes in the country, but their destiny is uncertain after the foreign funding sources are terminated. Ward #7 of Patan has established a very informal "latrine committee," but have been thwarted in all attempts to procure funding for maintenance (ca. $25/month) from the Lalitpur Nagar Panchayat. Further, the wards are not authorized to levy local taxes even for local projects.

There are no local donations of materials or labor for its construction, but the residents were directly involved in the site selection and design, and were paid to operate the system until September 1978 when the AID funding was frozen.

Imported costs (from India)	US $	500.00
Local costs		3,100.00
Total cost	$	3,600.00
Per latrine cost	$	200.00
Per beneficiary cost		4.50
Recurrent costs: annul maintenance (24-hour janitor) and minimalmaterials		300.00
Annual recurrent cost/beneficiary		40
Approximate 5-year totl average annual adjusted cost per beneficiary(10% interest)	$	1.57

Lalitpur Community Latrines

Sponsored by the Lalitpur City Development Program (Lalitpur Nagar Bikaas Yojaana) 56 latrines were built at 12 locations throughout the town of Patan. Severely overdesignedby city engineers, with mistakes too numerous to mention here, virtually all of them were befouled and inoperable within two weeks of their dedication. No funding arrangement was made for their maintenance, and water supply was erratic. No local labor or materials were donated, and local residents were not consulted on their design and operation. Its current state of deterioration and filth continues to reaffirm local residents' beliefs that improved latrine systems never work.

Imported costs (approximate)	US $ 2,000.00
Local costs	23,210.00
Total cost	$25,210.00
Per beneficiary cost	$ 12.00

Rasawa-Nuwakot Integrated Development Project Latrines

Headquarters: Kathmandu and Trisuli. A number of latrines were installed in rural areas as part of this World Bank-funded program. Visitors to the installations have said that they have gone unused.

UNICEF

(Lazzimpat, Kathmandu) UNICEF, in coordination with the National Development Service, has not built latrines as part of their health projects, but they have printed a small booklet (10,000 copies) in simple Nepali illustrating the need for improved sanitation, and the techniques for building simple pit latrines. Printing costs were approximately $0.25/booklet, and they were distributed to all the schools and health posts of the kingdom. They may have been of help to teachers who were concerned about school sanitation, but did not know how to build a latrine.

Village latrines

The simple improved village pit latrine, dug occasionally by villages who have had some education, is perhaps the most inspiring example of an appropriate technology that has developed entirely through local self-motivation. Additionally, these innovators have had a great impact on their neighbors in the village. There are some Brahmin-Chhetri villages in the Pokhara area, for instance, where a significant proportion of the homes have pit latrines. Among the Gurungs and Magars in the outlying areas of West Nepal, pit latrines are sometimes dug by returning British and Indian Gurkha Armed Forces pensioners. They are by and large simple pits no more than two meters in depth, covered with open-framework bamboo or wood planking, and surrounded above with cut brush or bamboo screening. There is usually no expense invested in their construction since all materials are available locally on the homestead. The wastes are not reused. The only significant technical fault with their design is the open-framework squatting platform which does not entirely preclude fly-breeding. The reason for this is the owner's logical anticipation that if the latrine platform were to be plastered over except for a central hole, someone would eventually befoul it. With this design, if the pit is dug deeply enough, however, fly-breeding should be reduced. The replication of similar pit latrines throughout rural Nepal, initiated by local development and educational bodies/projects in conjunction with innovative local citizens will have the greatest chance (regardless of the proposed investment) of improving the country's hygiene and health.

SANITATION TECHNOLOGIES FOR NEPAL

Prerequisites for Successful Latrine Operation

The need for water:

With pit latrines, it is not necessary to supply water to each latrine, but it is more important that water be available closer to the house than the nearest natural flowing source. Some men use water carried from the river or spring to perform their daily ablutions (since it is carried almost exclusively by women), while many find it easier to go to the river themselves. A water tap can short-circuit this pattern. It is a direct incentive for villagers to use a latrine in the vicinity of the tap or their home. In some areas stones or other material are used for cleaning in preference to water, and in these areas latrines may see more use, since supposedly the patron would not be dependent on a nearby source of water.

All of the water-seal latrine systems such as aqua privies, septic tanks and septic vaults require a round-the-clock water supply. When it stops, it takes but a short time for the squat-pans to become clogged and the vicinity befouled. A water tank large enough to accommodate periods of reduced water flow and heavy peak-period demand is essential. Peak demand can reach 15-30 times the average demand, thus the importance of designing the water system to handle it cannot be overstated.

Maintenance:

Minimal with homestead pit latrines, and doesn't require an untouchable-caste laborer. Water-seal systems need janitors who make frequent visits to:

1. Clean messes and unclog latrines before they get out of control.
2. Demonstrate correct use and reprimand misuse.
3. Keep women from using the water for clothes-washing and household purposes.
4. Keep vandals away.
5. Repair or replace broken parts such as water taps and light bulbs.

Education:

The purpose of constructing and using sanitary facilities must be communicated before they will be used, and before improved sanitation can be realized. Men must be shown that if the women have intolerable sanitation, the health of the men will be affected as well. Some of the institutional channels for such education are discussed below.

Design and Location:

The primary design consideration for village pit latrines is that they can be fashioned from locally available materials that do not have high-priority alternative uses. Simple pit latrines as described above are ideal in this respect. The use of materials not available within the village, especially imported components, normally act as disincentives for the construction of latrines, even when these materials are donated. Most villagers consider it illogical to use cement, for example, in the construction of a latrine, and will actively attempt to divert this coveted and relatively scarce commodity for other uses. The degree of improvement that cement and other imported components can bring to pit latrine design should be more thoroughly investigated. Comparison should be made between pit latrines with sealed floors and those with open-framework floors with regard to their cleanliness and effectiveness in reducing fly-breeding. For many areas, the trade-off may favor the open-framework floor. The feasibility of including a simple door for latrine hole should also be tested. Community latrines face the combined problems of general disregard and abuse of communal property, and the responsibility for maintenance. Bamboo screens shielding community latrines are soon removed by villagers who think that they "belong to nobody."

Lastly, the location of village pit latrines plays an important role in their success. Some private homestead latrines have gone unused after being located at a distance from the house that people feel is inconvenient. If the completed latrines are not specifically segregated by sex, the women of the community may forego using them at all.

Latrine Technologies

Pit latrines:

Materials and labor for pit latrines are estimated as follows, though these are not considered costs by the typical villager:

Labor (3 man-days)	Rs.	45/-
Materials (bamboo pole and screening)		40/-
Total (± 20%)	Rs.	85/- ($7)

Water-seal latrines:

These have specific design features that are peculiar to Nepal. Noteworthy among these are:

The pan. These are cast in cement and finished with a smooth surface in Kathmandu and some Terai towns; the technology is adaptable wherever cement is used. The ring of the pan, 3 cm. below the footpads, is usually flat; this can be special-ordered (at no extra charge) to slope inward so that the bowl of many of these pans is also virtually flat, and night soil can easily collect there if large quantities of water are not used for cleaning and flushing. The advantage of this flat "shelf" should not be overlooked, however: it allows the latrine patron to view his stool. The technical problem of possibly allowing this without leading to clogging and pile-up problems is significant, and worthy of further investigation. A flushing mechanism for each latrine is one answer to this. The effluent hole of many pan designs is too small (5-7 cm.) and has led to clogging.

All floor surfaces within the latrine should be plastered smooth and slope toward the pan. Red oxide can be mixed with a rich mixture of cement plaster for the floor, to provide a smooth, non-porous surface. It is important that stones not be used in water-seal systems. They cause clogging and can quickly fill the septic container. A consistent water supply will discourage this. Excess sand (brought in on the feet of patrons) can also fill the tank slowly. To help mitigate this, the entranceway to a latrine complex should be of brick or cement and kept clean. Water taps should be of the most durable self-closing type, installed with one-way screws.

The typical cost for a four-hole aqua-privy or septic vault system is estimated below:

Labor (coolies: Rs. 8/-per day, skilled laborers: Rs. 15/-per day, Overseer: Rs. 25/-per day)	Rs. 500/-
Materials	3,500/-
Total (± 20%)	4,000/-($336)

Imported costs are unnecessary unless steel reinforcement is desired (if latrines are to be on a slab directly over the vault) and tin is substituted for tile roofing.

Gobar gas latrines:

Latrines connected to gobar gas (bio-gas) plants have not proven popular in India, in spite of a 50% subsidy offer from the Khadi and Village Industries Commission. There are two gobar gas plant/community latrine systems in Nepal, each connected to four latrines. They are built in Tibetan refugee communities, and for this reason have been successful since Tibetans are not averse to the concept of a latrine. The idea of cooking one's food on any kind of human waste by-product is met by most Nepalese with disgust, but there are a growing few with working bio-gas plants who are curious that it might be a wise use of resources and perhaps not so unappealing. The quality of the gas does not change with the attachment of a latrine. Only one of the 5-6 gobar gas latrines visited by this author in India was used by its owners. The cost of adding a latrine and influent pipe to a gobar gas plant under construction is about Rs. 800/- ($67.00). Retrofitting would be difficult, if possible at all.

In the women's community latrine bio-gas digestor in Patan, the carbon: nitrogen ratio is too high for optimum gas production, the CO_2 content is slightly too high (ca. 45%) for continuous gas combustion, and there is a difficult scum problem in the digestor. Retention time is approximately 80 days in the digestor (at 18-22°C) and longer in the two "drying" pits. The scum which forms on the drying pits is occasionally removed with a rake.and composted with other dried organic matter, such as leaves, and removed to the fields once a year. Some of the liquid portion of the effluent does escape to the original rivulet into which raw wastes formerly flowed, but only after an apparent BOD reduction (gauged by a noticed decrease in fly breeding and odor). It is not recommended that night soil be used as the sole substrate for bio-gas digestion. Further, direct-feed systems may develop scum problems impeding their proper operation, unless sufficient pre-digestion mixing can be achieved.

Compost privies:

The composting privy (see the VITA sanitation booklet) is an intelligent adaptation of the pit latrine, requiring only a slightly greater minimum depth. If covered properly after filling, it should yield a fertilizer that is not only safe, but more importantly in terms of its appeal to villagers for reuse, unrecognizable as night soil.

Generally, the success of a latrine or sanitary system will be in direct proportion to the amount of community participation in its design, construction and operation. The women's community latrine complex (in Patan) and the Bhaktapur central sewage system, which have had only peripheral community participation, are the exceptions. It is noteworthy that these improved installations were constructed directly in the traditional community defecation areas, giving the residents no choice but to use them.

IMPLEMENTATION CHANNELS AND STRATEGIES

The following Government offices and other institutions are among those currently most suitable for absorbing a nationwide sanitation improvement scheme. Training and information dissemination are strongly emphasized. Most rural villagers have the wherewithal to dig simple pit latrines, specifically, but require education, motivation and technical guidance.

NDS/UNICEF/Health Ministry

The National Development Service (Rastriya Bikaas Sewa, Tribhuvan University) is the mandatory one year of service at a rural post (usually a secondary school) that all Tribhuvan University students must complete before graduation. They are encouraged to initiate and engage in local development activities. Several have built latrines at their posts, and for this have received guidance and material assistance from UNICEF. Mr. Andrew Quarmby is the sanitation advisor to UNICEF, and has worked advising students in sanitation and printing literature specifically for NDS students. A brief hands-on sanitation component in the NDS students' pre-posting training would be a logical approach to transfer the skills needed to build rural latrines. Many of the NDS students have teaching duties in their school posts, and they could easily include latrine-building objectives and techniques in their curriculum. Funds could be made available to them to assist the school, and possibly individual students, in the construction of latrines.

UNICEF also works closely with the Health Ministry (Mr. Stewart McNab is the UNICEF nutrition officer) and they have acknowledged the integral part that sanitation plays in health and rural water supply --the two areas that UNICEF has most heavily invest in. However, other than distribution of their pit latrine booklet, specific address of rural sanitation issues by the Health Ministry and UNICEF has been minimal. Working with Health Ministry personnel for the establishment of improved sanitation at the forefront of health care and health education is a high priority. The inclusion of sanitary engineering in the training of paramedical personnel assigned to rural health posts could be an offshoot of this. Their family planning, soil conservation and "mother's milk" radio advertisements and documentary films (daakment) shown in rural villages, have had a very popular response.

Agriculture Extension

The Department of Agriculture's extension programs are known to many farmers and are helpful to some through subsidy of the more innovative (risky) project activities. One of the more appropriate extension activities that the "JTs" (junior technicians) and "JTAs" (their assistants) could adopt would be the demonstration and encouragement of composting privies for fertilizer production. Unlike the more capital-intensive and risky agricultural projects that the extension agents commonly encourage, a compost privy program should be more attractive to the risk-aversive farmer. The innovative farmers of each district are the ones most likely to be interested, and it is precisely with them that the JTs have developed strong working relationships. The only disincentive is the unlikelihood of the farmer realizing a marked short-term increase in agricultural productivity; but such a program would no doubt be an intelligent and economical use of resources in the long run.

School System

(Ministry: Kaiser Mahal, Kathmandu) The education system has also had a pervasive influence on all rural regions of the country; almost every household has a child who is or has studied in school at one time. The majority of all primary and secondary schools in the country, however, do not have any latrine facilities, and those that do seldom operate. Several school days per year are devoted to school-area work projects such as grounds beautification, pathway maintenance, garden planting and building construction. For this, students bring materials and tools from home and work is enforced in lieu of classwork or sports attendance. It would take but few of these project sessions to build school latrines. In the schools that do have facilities it seems, ironically, that the latrine patronage by students is greater than that by teachers.

The natural science curriculum taught in the school system would be the logical place to introduce these concepts to the young, but it is a rare teacher who has the ability to effectively communicate such abstract cause-and-effect relationships to a student body that is poorly prepared, easily distracted and culture-bound. But the education and participation of young students in sanitary techniques will be a major key to its improvement in the years to come; sanitation should have been included in the curriculum long ago. The eventual breakdown of caste prohibitions regarding the handling of night soil would be one beneficial, but extremely slow-to-realize outcome of this.

Gurkha Training Program

The British Gurkha Resettlement Program sponsors training programs for returned pensioners covering improved agriculture, animal husbandry, etc. Some of these training sessions are at the Paklihawa pension camp in the central Terai, and at another camp in the Eastern hills. The Agriculture Development Farm at Lumle, near Pokhara, also trains pensioners from that area. Their program structure and outreach methodology is ideally suited for the training of low-risk sanitation technologies and concepts, and the trainees are generally innovative and educated, due to their background in the service. Being army pensioners, they are also well-respected citizens of their community. The pensioner resettlement fund also sponsors small individual village projects, such as drinking water systems.

Volunteer Programs

In the Fall of 1978, the US Peace Corps/Nepal will initiate an innovative auxiliary "appropriate technology" component for volunteers being trained for positions in all fields. Sanitation concepts and the aspects of digging latrines will form a major part of this component, and all volunteers will be encouraged to build latrines at their village posts. Volunteers who have installed them in the field to date have had mixed, but steadily improving success in getting other villagers to consistently use them. Similar programs for other volunteer agencies are recommended. Working as full-time "sanitation extension agents," advising on latrine construction and organizing community educational programs and training sessions, would be a frustrating and potentially rewarding job for volunteers.

Tourism Department

The Department of Tourism has had growing complaints of the poor sanitation that pervades touristed areas. The development of urban latrines that are acceptable to foreigners and yet tamper- and foul-proof would be of keen interest to them. The digging of one labeled latrine per village along trek routes, for example, would preclude the inconvenience and embarrassing situations that trekkers now face. It is likely that a program of sanitation improvement in touristed areas would recover its cost through increased tourism income alone.

Panchayats/Back-to-the-Village Campaign

The successful implementation of all of the programs proposed above may depend largely upon the encouragement and cooperation of the Panchayats. This may be slow to evolve because of the often intangible results and political in-utility of improved sanitation. However, cooperation of the Panchayats with the central government and development programs has been good after repeated exposure to new concepts. Family planning, for instance, is now a household word. Roads, football fields, bridges and water systems are routinely built by centrally-organized, Panchayat-level implemented, and villager-executed programs. Community latrines are also suitable to this shramdaan communal labor activity. The risk of failure for a system built in this manner is normally fairly high for much of Nepal, but an intelligent assessment of this local commitment to participate in latrine construction, operation and maintenance in the more innovative villages may determine which ones are distinctly low-risk. In city areas, a prohibition against urination in public places should be enforced.

The District Panchayats often have funds earmarked for community development purposes, but the kinds of projects undertaken typically meet the needs or desires of only a localized few. Unfortunately, latrines are not politically useful to the influential local politician, so their construction is seldom promoted in the decision-making process. Some of these decision makers are unaware of the extent of the degradation of their local sanitation, and this should be exhibited to them. As education and concern for health inspires citizens to press for better sanitation, the District Panchayat development programs will perhaps be further disposed to latrine investment.

The Back-to-the-Village Campaign (Gaou Pharka) was conceived ostensibly to assist the more rural areas in the management of their political affairs and to take development out to the grass-roots village level where it belongs. With strong central directives, they are in a position to help educate, encourage and offer guidance in improved sanitation. Each district office in turn has close ties with the Village Panchayat members in the district.

LDD

The Local Development Department is responsible for small-scale rural development projects such as schools, hospitals, footbridges and drinking water systems. Chiefly, they supply materials (much of it is donated by UNICEF) and engineers to rural project sites. Pipe and plumbing fixtures for a sanitary installation would normally be handled by the LDD. They are now set up to examine requests for materials and technical guidance to build latrine systems from village Panchayats. But few requests have been made, and there are few if any engineers with experience in sanitation systems. With the training of engineers and the solicitation of the numerous potential requests for assistance (now looking for a door to knock on), sanitation can take a place alongside "bridges" and "water supply" in the LDD. They have a rigorous policy of ascertaining the full extent of the community participation in a proposed project, since the LDD never supplies labor.

CONCLUSIONS

The health of Nepal's growing population and its status as a tourist paradise is in jeopardy unless the atrocious sanitation that plagues the kingdom can be abolished. But not only the physical health and beauty of the country is at stake. The side-effects of the current unsanitary conditions are subtly undermining Nepal's ecology, culture, economy and capacity for development.

Ultimate improvement of the standard of living in all facets of life for the Nepalese has, and will come chiefly through community commitment and involvement. And ultimately, community participation is the best mechanism for assuming the task of sanitation improvement. A system that requires even a minimal daily commitment (its use and maintenance) will function only if the inspiration and motivation have come from the patrons themselves.

The simple pit latrine, perhaps with some minor modifications, is the most appropriate waste disposal technology for rural Nepal. The minimal investment of time and materials required most closely matches the benefits yielded and most villagers view these as insubstantial. Pit latrines are inappropriate for urban areas and large Newar bazaar towns. Here, if water and ongoing maintenance accommodations are plentifully supplied, an intelligently planned sanitation system will meet with success.

Incentives in the form of subsidy, donated materials or technical guidance may well encourage villagers to dig latrines, but they will not cause the villagers to use them. Nepal's rural villagers are as rational and innovative as their brethren from the developed countries; sanitation concepts have merely been missing from their traditional, and now, their present Western education. A full understanding of sanitation should be sufficient to convince most of the need for proper waste disposal.

It is unlikely that any single department of the Government of Nepal has the capability to manage a nation-wide decentralized sanitation improvement scheme. Thus, it is essential that development efforts be applied to all departments of the government and segments of society, with special emphasis on those listed in the preceding section. Simultaneous with the promotion of sanitation, it is important that field testing and data collection on the technology and sociology of rural sanitation begin, so that the numerous problems encountered heretofore can be prevented.

Fundamentally, it is essential that there be recognition in high government offices of the need for adequate sanitation, not only for the health of the populace but for the economical, and consequently political stability of the country. Many of those now working in government were raised in an age when sanitation facilities as such were virtually unknown, even while they were studying advanced Western sciences and abstract concepts. This basic naivete' may severely hinder the rapid development in all sectors of Nepalese economy and society that is proposed for the years to come.

SUMMARY

Nepal has virtually no tradition of sanitation or waste management, and there are only token sanitary facilities at present. Gastro-intestinal disease spread by ubiquitous fecal-borne pathogens eclipses malnutrition as the primary source of ill health and loss of productivity. Ignorance of the interconnection between poor sanitation and health is universal, while taboos and caste prohibitions regarding the management of night soil are prevalent. The aversion to defecating in the same place every day is compounded by villagers' need to see their stool -- significant hindrances to the promotion of latrines.

The population and the production of human waste is growing, and this waste has begun to markedly degrade the quality of local environments and severely contaminate streams that are downriver sources of drinking water. Nepal's dearth of the crudest sanitation measurements has rendered it a disenchanting health hazard for tourists, the principal source of foreign enchange.

Concern is growing among progressive-minded citizens, but the social, political and technical mechanisms necessary to begin improvement of the present conditions are inadequate and poorly coordinated. The motivation of community interest, cooperation and participation will be a limiting factor in the success of a latrine system, and the most difficult to undertake.

Valuable experience has been gained from improved latrines installed to date: most have suffered from overdesign and recurrent cost recovery problems, factors that should be considered in future installations. Water-seal systems, suitable only for urban areas at this time, are heavily dependent on consistent water supply and maintenance for their operation. Pit latrines are the technology of choice for the bulk of rural Nepal. They are inexpensive, simply and easy to maintain; some educated and hill peoples have constructed and used them.

The education of Nepal's young in the concepts and techniques of sanitation, in conjunction with scattered functional/demonstration latrines built by innovative villagers will be one of the most expedient ways to begin the nationwide reversal of poor sanitary habits. Specifically, at this time some of the institutional channels which are best adapted for assuming a sanitation improvement program are:

- The NDS, A Tribhuvan University program in which undergraduates undergo a mandatory year of field service and are urged to initiate local development projects.
- The education system, which could encourage the construction of latrines and include sanitation as part of its curriculum.
- The British Gurkha Resettlement Program, which trains innovative returning soldiers in improved agricultural techniques, could teach the principles of sanitation in demonstration workshops or as part of other training programs.
- Auxiliary sanitation training could be given to all foreign volunteers sent to work in the field.
- Compost privies could be encouraged through the pervasive and relatively successful agriculture extension programs.
- The Local Development Department could handle requests for materials and technical guidance from village Panchayats and local development bodies.
- The Department of Tourism could sponsor the construction of latrines in areas heavily visited by tourists and trekkers.

The success of all of these programs will further depend on concerted central government directives. For Nepal, sanitation is not an investment that villagers imagine to yield benefits, so the importance of thorough education and rational, directed incentives will be essential. The task is a difficult one, and necessarily long-term, but is of the utmost urgency.

HYGIENE INFORMATION PACKET

Guidelines for Purifying Water

Boiling

In this method, water is allowed to boil for fifteen minutes after the first bubbles appear. It is important to follow this procedure because the process is dependent on both heat and time. Some organisms will be killed at high temperatures, but only after exposure to that temperature for a certain period of time.

Once the water has been boiled, a pinch of salt can be added to improve the taste.

Boiled water should be stored only in disinfected, covered containers with a tap for dispensing water to avoid contamination. A cup should never be used to remove boiled water from a container.

One problem with boiling water is fuel. In many places, the only available fuel is wood, which can be expensive. In addition, the excessive cutting of trees contributes to soil erosion, which may lead to flooding. Where possible, other fuels should be used. One such alternative fuel is gas that is produced from animal manure (buffalo, cow). This process is called biogas.

Chlorine

Chlorine compounds render water safe to drink if the chlorine is added in the proper amounts and if the water is allowed to stand for 30 minutes before drinking. The amount of chlorine to add depends on the compound used and the condition of the water. Ordinary household bleach is an excellent source of chlorine.

Cloudy water contains organic matter which will combine with the chlorine, taking it away from its intended use as a disinfectant. The usual procedure in this instance is to double the dosage as indicated in the table below. The stronger chlorine compounds require proportionately less chemical to disinfect.

Dosage of Bleach Solution 5% Active Ingredient

Amount of Water	Clean Water	Cloudy Water
1 liter	2 drops	4 drops
4 liters	8 drops	16 drops
11 liters	¼ teaspoon	½ teaspoon

Iodine

Another excellent chemical used for disinfection of drinking water is iodine. This is commonly available as 2% tincture of iodine which can be purchased at any pharmacy. The usual dose is five drops of iodine for every liter of clear water. The dose is doubled for cloudy water, although it is better to first filter the water. Once treated, water should be allowed to stand for 30 minutes before use.

All disinfected water should be stored in a disinfected container complete with a lid and top. Care should be used in handling the iodine solution because of its staining properties.

Adrounie, Harry; Chelikowsky, Bruce R; and Hagen, David L. Environmental Health Field Manual for Sanitarians. Honolulu: Rural Sanitation Manpower Development Project, University of Hawaii, 1980.

Basic Guidelines for Personal and Dental Health

1. Always wash your hands with soap when you get up in the morning, after having a bowel movement and before eating.

2. Bathe often -- every day when the weather is hot. Bathe after working hard or sweating. Frequent bathing helps prevent skin infections, dandruff, pimples, itching and rashes. (Where water sources are limited, learn to conserve water. Take frequent sponge baths. Be sure not to contaminate your safe water supply. Pour the water you'll need into another container for use.)

3. In areas where hookworm is common, do not go barefoot. Hookworm infection causes severe anemia. These worms enter the body through the soles of the feet.

4. Brush your teeth at least once a day and, if possible, after every meal. If brushing is not possible for some reason, rub your teeth with salt and baking soda. (See Werner, page 230.)

5. Ideally, being able to run a strong thread or dental floss between your gums and teeth is good. If this is not possible, toothpicks or sharpened sticks can be helpful.

6. If children or animals have a bowel movement near your house, clean it up as quickly as possible.

7. Hang or spread sheets and blankets in the sun often. If there appear to be bedbugs, pour boiling water on the bed and wash the sheets and blankets.

8. Beware of dogs and cats from outside. Don't let them into your house. They can carry fleas and other insects which can cause disease.

9. Try to clean your house often. Sweep and wash the floors, walls and beneath furniture. Fill in cracks and holes where roaches, bedbugs and scorpions can hide.

10. Ideally, all water that does not come from a pure water system should be boiled before drinking. This is especially important when there appear to be cases of typhoid, hepatitis, cholera or diarrhea. Water from holes or rivers, even when it looks clean, may spread disease if it is not boiled or disinfected before use.

11. Try to store foods in insect- and rodent-proof containers to prevent contamination. Keep food covered.

12. The common use of human feces for fertilizer makes it necessary to kill intestinal pathogens which may be on foods, such as fruits and vegetables. A disinfectant such as chlorine or iodine will kill these organisms.

13. Use clean cooking utensils and dishes. They should be washed with hot water and soap, air dried in the sun if possible, and stored in a clean place. It is especially important to use hot water and soap when washing dishes used by a sick person so that germs will be killed and not passed on to healthy people.

14. Only eat meat that is well cooked. Be careful that roasted meat, especially pork, does not have raw parts inside. Raw pork can carry the organisms responsible for the disease trichinosis.

15. Be careful of food that is old or smells bad. It may be poisonous. Don't eat canned food if the can is swollen or squirts when opened. Be especially careful with canned fish.

16. Pay attention to your diet. Good nutrition helps protect the body against many infections.

17. If you smoke cigarettes, try to quit. Put your energy into something healthier and more constructive.

18. Try to get some kind of daily exercise like walking, doing calisthenics, bicycle riding or other activities in which you use your heart and lungs.

Information from:

- Werner, David, Where There Is No Doctor
- Environmental Health Field Manual for Sanitarians, RSMD Project, University of Hawaii, 1980.

BASIC INFORMATION CONCERNING SOLID WASTE AND EXCRETA DISPOSAL

Solid Waste Disposal

Our concern about solid waste is that if not properly disposed of, it attracts rodents and insects, water and air become contaminated, fire hazards increase, unpleasant odors are common and the area looks unattractive. The rat is a very common inhabitant of places where solid waste is deposited. Food and shelter are provided and the rats multiply. Aside from the danger of a rat bite or problems associated with damage to crops and stored food, rats present a health problem in the form of typhus and plague. The flea, which is the vector, uses the rat as his transportation and ultimately its destination may be us. By removing the rats' food and shelter, the rat population will be contained and the prospects of disease transmission occurring will decrease.

Insects will always be with us but we can reduce our exposure to them by taking simple, yet effective steps. Insects require food to live and a moist habitat to breed. Many types of solid waste, especially garbage, provide these two items. While other insects may be a problem, flies are the ones we are concerned about due to their ability to transmit organisms to man from an infected source. If solid waste is disposed of properly, the fly will have to search elsewhere for its food and breeding area.

Some ways in which to dispose of solid waste include:

1. Burning all garbage that can be burned. However, the main problem with this practice is that the solid waste is never fully incinerated. Besides the residue of ash, many of the items in the waste will be found intact. This applies not only to plastic or metal, but also to garbage. If the garbage is not fully burned, it retains its lure to our public health enemies, the rat and the fly. So another possible method for waste that isn't burned is:

2. Burying solid waste in the earth. Garbage that cannot be burned should be buried in a special pit or place far away from houses and the places where people get drinking water. (Werner, page 137) These wastes should be buried and covered with at least 45 cm. (1-1/2') of earth. Other methods include:

3. Recycling.

4. Composting organic material.

Excreta Disposal

There are many different ways to dispose of excreta, and they all should adhere to the following requirements:

- The surface soil should not be contaminated.
- There should be no contamination of ground water that may enter springs or wells.

- Excreta should not be accessible to flies or animals.
- There should be freedom from odors or unsightly conditions.
- The method used should be simple and inexpensive in construction, operation and maintenance.
- Use the excreta for agricultural or other uses only after it has been treated.
- In the installation of excreta disposal facilities, a safe distance from water sources should be maintained (at least 30 meters or 96 feet).

The most common type of excreta disposal system found in rural areas is the pit privy. It is composed of a hand-dug pit over which is placed a squatting plate or slab. A shelter is usually constructed around this. The pit privy is a minimum-cost solution providing for defecation with or without water use, excreta storage, digestion of waste solids and seepage of urine and moisture into the surrounding soil. Once full, within 50 cm. (2') of the top, it should be filled in and another pit used. After nine to twelve months, the old pit may be uncovered and the sludge remaining used for fertilizer. It takes this time for all pathogenic organisms to die. Once emptied, the old pit can be used again.

The location of the privy is important. Place it downhill and maintain a distance of at least 30 meters from a water source unless the well is very deep (30 meters or more). The size is also important. Ideally, pit privies should be designed to have at least four years storage capacity. The sludge volume for a dry pit (one which does not penetrate groundwater) is 40-60 liters (approximately 10-15 gallons) per person per year. Due to the digestion of sludge which takes place in the pit and percolation of liquid into the soil, the actual volume of material may be reduced to 20% of the total volume of feces and urine deposited. A pit 2.5 meters (8-1/2 feet) deep and 90 cm. (3-1/2 feet) square should serve a family of six for five years.

Adrounie, Harry; Cheliokowsky, Bruce R.; Hagen, David L. Environmental Health Field Manual for Sanitarians. Honolulu: Rural Sanitation Manpower Development Project, University of Hawaii, 1980.

GUIDELINES FOR ASSURING FOODS ARE CLEAN

Some illnesses are caused by unclean foods, foods which carry disease-causing organisms.

Foods Usually Involved	Ways to Prevent Spread by Food
Raw fruits and vegetables contaminated by dust, flies, water, soil, night soil fertilizer	Wash thoroughly with Lugol's Solution (see explanation following); remove peels; cook thoroughly if possible.
Raw or undercooked meats and meat products	Cook these foods thoroughly. Cook garbage fed to swine. Get rid of rats in hog lots.
Cracked or dirty eggs contaminated with poultry excreta, meat meal, bone meal, or fish meal. Poultry meat contaminated by unsanitary handling	Use only clean eggs with sound shells. Soiled eggs should be washed. Handle poultry meat and eggs under clean conditions. Store them in a cold place. Cook thoroughly and refrigerate if not eaten at once. After handling raw eggs or poultry, wash your hands thoroughly.
Home canned foods, or sometimes commercially prepared foods	Cook canned meat and vegetables thoroughly before serving. Boil 15 minutes and stir to make sure you heat all parts.
Moist or prepared foods, milk, other dairy products or water contaminated with excreta	Strict personal cleanliness in food preparation; keeping moist foods cool during storage periods; cooking foods before serving; getting rid of flies. Persons with dysentery should not handle food. Dispose of human wastes safely.
Raw contaminated milk, dairy products or meat	Get rid of brucellosis from livestock by vaccinating young animals and slaughtering infected older animals. Boil milk used to drink or to make other dairy products.
Milk contaminated by humans with illness	Make the milk safe by boiling. Search for the person carrying the illness and isolate him from other people.

Foods Usually Involved	Ways to Prevent Spread by Food
Foods contaminated by a discharge from the mouth or nose of a person who has disease germs in his body, whether he is sick, about to get sick, or immune	Boil milk used for drinking or to make other dairy products. Keep persons with the disease from handling food. Separate them from other people.
Milk from cows with udder infections caused by these organisms	

* * *

Lugol's Solution

This is an iodine compound which is an effective disinfectant and is available at most pharmacies. The solution should contain 5% iodine or 50,000 ppm when purchased. It should be kept in a brown glass bottle. (Light in the presence of air will destroy the iodine very rapidly if it is kept in a clear glass container. The concentration will decrease in a brown bottle also, but much slower.) Lugol's should prevent a bright light from passing through the bottle and solution and a person should not be able to see the bottom of a tablespoon full of Lugol's when held in a brightly lit room. If these two criteria aren't met, then the Lugol's is weak and the amount used must be increased.

If using Lugol's, the following dilution schedule should be followed:

1. If Lugol's solution appears dark and is used within one month of the date of purchase, add five tablespoons to every four liters of water.

2. If Lugol's solution appears dark brown and is not used within one month of the date of purchase, increase the amount by one tablespoon per month after the first month of purchase. For example, during the first month after purchase, use five tablespoons and during the second month, use six tablespoons.

3. If Lugol's allows light to pass through it, do not use it. Purchase a good bottle.

4. Always allow vegetables a contact time of 20 minutes with "good" Lugol's. Keep it in a cook, dark place.

5. The above schedule can also be used with chlorox.

GENERAL GUIDELINES FOR FOOD PURCHASING, STORAGE, PREPARATION AND SERVING

When you purchase, prepare and serve food, it is important to:

- Select good quality food. Food should smell fresh, come from a clean source, be protected from flies and dirt and have a fresh attractive look and color.
- Keep yourself clean.
- Keep dishes and equipment clean.
- Keep the cooking and eating area clean.

Food can become unsafe to eat if it is:

- Served by a person carrying disease germa
- Served in soiled dishes
- Eaten with dirty utensils and hands

Keep everything clean. Cleanliness helps to keep away disease germs. Clean food is likely to be safe food.

When preparing foods:

- Store them for a very short time.
- Prepare in clean containers.
- Cook thoroughly.
- Serve immediately.
- Don't save leftovers unless you can put them in clean, covered containers in a cool place.

CAUSES OF INFECTIOUS DISEASE

Viral

A virus is the smallest organism that causes disease. It is classified between living and non-living matter. The body can become immune to viral diseases through antibodies, either produced in the body or introduced by means of immunization (vaccination). Some diseases caused by viruses are: common cold, flu, chicken pox and shingles, smallpox, polio, herpes, measles and pneumonia. Many viral illnesses are self-limiting and almost all viral infections do not respond to antibiotics.

Bacterial

These organisms are classified somewhere between animal and plant and are responsible for a wide variety of illnesses. Not all bacteria are pathogenic, and many are necessary for good health. Some diseases of bacterial origin are: tuberculosis, typhoid fever, shigella, venereal disease, tetanus, leprosy, yaws. Antibiotics are appropriate for bacterial infections. However, they kill many types of bacteria and may cause an imbalance and another (yeast) infection. The body produces antibodies to combat bacteria; immunizations produce antibodies as well. Bacteria may be controlled with disinfectants and antiseptics.

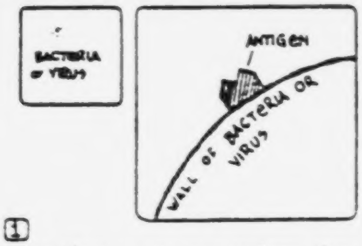
Fungal

The fungus reproduces with spores and often appears as a skin disease. Examples of fungal diseases are ringworm, athlete's foot, jock itch and certain ulcers.

Protozoan or Parasitic

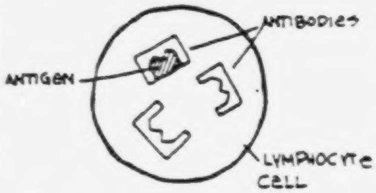
These are simple animals that cause illness either from within the body (amoeba, giardia, hookworm, tapeworm, roundworm, etc.) through the fecal-oral route of transmission, or from outside the body, as in insect bites or direct contact with the parasite. Some other examples include scabies, malaria and river blindness.

ANTIBODY CREATION



1

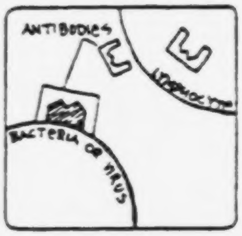
A bacteria or virus enters the human body through the mouth, a break in the skin, a mucous membrane, etc. Then lymphocytes - a type of white blood cell - discover the bacteria or virus + recognize a protein substance on the wall of the virus or bacteria (called antigen) as foreign or as not normally belonging in the body.



2

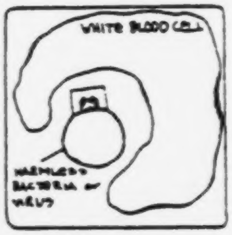
The lymphocyte cells create proteins (called antibodies) which are structured in such a way as to join with the specific antigen.

Note: Scale is purposefully distorted. Understand that a lymphocyte is many thousands of times larger than a bacteria or a virus.



3

The lymphocyte releases the antibodies, which it has created, into the fluids of the body, to combine with the foreign proteins on the surface of the bacteria or virus. When combined this renders the virus or bacteria harmless to your body.



4

Another type of white blood cell engulfs the now harmless bacteria or virus and carries it to other parts of the body to get rid of it

5

This process makes immunisation possible. With immunisation, virus or bacteria are first rendered harmless though the antigen on their walls remains intact. A small amount of this substance is introduced to your body. Then your body creates antibodies to combine with that specific antigen. Your body has then developed a large stock of those specific antibodies so that if the live virus or bacteria were to come into your body you would already have the "knowledge" and/or the anti bodies to easily protect yourself from the infection.

From The Well Body Book, by Mike Samuels, M.D., and Hal Bennett, New York: Random House, 1973, p. 343.

IMMUNIZATION

Vaccines are special "medicines" which if administered properly can prevent some diseases. We call this process immunization.

Immunization: Immunity and Antibodies

If you had whooping cough as a child, you only contracted it once because your body became immune to it. The body produces certain antibodies which are special proteins found in the blood. These antibodies fight the organisms that cause disease or the toxins (poisons) that organisms make. Antibodies attach themselves to an organism and kill it off or they attach themselves to toxins and stop them from causing harm. The antibodies which fight toxins are called antitoxins. A different kind of antibody fights each organism or toxin. For example, measles antibodies only fight measles virus. They have no effect on malaria. Antitoxins against tetanus are not helpful against diphtheria.

While a child is ill with measles, the body begins to produce the special antibody against the measles virus. The body continues making this antibody; thus the child becomes immune and never has measles again. When the body makes its own antibodies, it has an active immunity. The body becomes actively immune in two ways, either from the disease itself, or from a vaccine. These vaccines are grown from harmful organisms and either killed (dead vaccines) or made weak (live vaccines). Because the organisms in a vaccine are weak or dead, they cause no harm beyond what may be mild symptoms (such as a mild fever). When the vaccine is given, the body produces antibodies against the particular organisms, thus preventing the body from becoming ill from the disease itself. When disease makes the body immune, it has a natural active immunity. If vaccine is given to make the body immune, it has an artificial active immunity.

Active immunity is the best kind because it allows the body to continue producing its own antibodies. The only problem is that it may take several weeks or longer before the body becomes immune. If necessary, the body can be made immune immediately by injecting antibodies from another person or animal. These antibodies give the body a passive immunity for a relatively short period of time (usually about two weeks).

The body can receive natural passive immunity while still in its mother's uterus. The antibodies and antitoxins are present in the mother's blood and are passed to the child's blood before birth. At birth, the child is immune to the same diseases as the mother.

Natural passive immunity explains why children do not usually have certain diseases until they are about three months old. By this age, most of the antibodies they were given at birth from their mothers have gone. By injecting new antibodies from an immune person or animal, we can give the body an artificial passive immunity. For example, we can inject tetanus antitoxin into an injured person who might have tetanus bacteria in his wound. The antitoxin makes the body immune immediately, before the body has had time to make its own antitoxin. The injected antibodies or antitoxin are soon destroyed, giving the body artificial passive immunity for not more than a couple of weeks.

It is important to remember that live vaccines die easily and become useless. Therefore, care must be taken in the transport and storage of such vaccines. The same is true of dead vaccines but to a lesser extent.

Examples of live and dead vaccines:

Live vaccines	Dead vaccines
BCG (against T.B.)	Diphtheria
Polio	Whooping cough
Measles	Tetanus
	Tetanus toxoid

Following is a representative list of some of the most frequently used immunizations. The actual selection may vary from one volunteer to another and from one country to another, depending on regional considerations, local governmental guidelines and changing circumstances. For example, a local outbreak of measles or cholera might mean immunizations for everyone. It is the responsibility of each volunteer to make sure that his/her immunization records are kept up-to-date during Peace Corps service.

Type	Vaccine Live/Dead	Immunity Active/Passive	Timetable
Yellow Fever	Live	Active	10 years
Diphtheria-Tetanus	Dead	Active	Booster
Cholera	Dead	Active	6 months
Gamma Globulin	Dead	Passive	3 - 6 months
Rabies	Dead	Active	2 years
Polio	Live	Active	Booster
Typhoid Fever	Dead	Active	1, in USA 1, one month later 1, three years later

From OPTC Basic Health Training Guide (Draft)

LIST OF MAJOR DISEASES AND THEIR GEOGRAPHICAL AREAS OF ENDEMICITY *

Some of the diseases which are found in AFRICA, categorized in terms of how they are transmitted.

Vehicle borne (water, food, fomites/inanimate objects):

Schistosomiasis
Amoebic dysentery
Hepatitis
Tapeworm
Roundworm
Typhoid fever
Cholera
Giardiasis
Shigellosis
Tetanus

Vector borne (flies, mosquitoes, other insects):

Malaria
Onchocerciasis
Filariasis
Trypanosomiasis

Direct Contact:

Hookworm
Conjunctivitis
Scabies (sexually transmitted)
Leprosy
Syphilis (sexually transmitted)
Gonorrhea (sexually transmitted)
Trachoma
Yaws
Herpes (sexually transmitted)

Animal borne:

Rabies

Air borne:

Tuberculosis

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* From OPTC Basic Health Training Guide (Draft)

Some of the diseases which are found in LATIN AMERICA, categorized in terms of how they are transmitted.

Vehicle borne (water, food, fomites/inanimate objects):

Typhoid fever
Tapeworm
Roundworm
Giardiasis
Amoebic dysentery
Hepatitis
Fungus
Cholera
Tetanus
Shigellosis

Vector borne (flies, mosquitoes, other insects):

Leishmaniasis
Chagas' disease (Trypanosomiasis)
Hemorrhagic fever
Malaria
Yellow fever

Animal borne:

Rabies

Direct Contact:

Syphilis (sexually transmitted)
Gonorrhea (sexually transmitted)
Leprosy
Trachoma
Yaws
Scabies (sexually transmitted)
Herpes (sexually transmitted)

Air borne:

Tuberculosis

Some of the diseases which are found in ASIA and the PACIFIC, categorized in terms of how they are transmitted.

Vehicle borne (water, food, fomites/inanimate objects):

Shigellosis
Tetanus
Schistosomiasis
Hepatitis

Vector borne (flies, mosquitoes, other insects):

Malaria
Filariasis
Dengue Fever
Encephalitis
Plague

Direct Contact:

Syphilis (sexually transmitted)
Gonorrhea (sexually transmitted)
Yaws
Hookworm
Polio
Scabies (sexually transmitted)
Leprosy
Herpes (sexually transmitted)

Air borne:

Tuberculosis

COMPETENCY ASSESSMENT/STUDY GUIDE

1. Name an example in each category. Describe its transmission, prevention and general treatment.

    A. Vector borne diseases (transmitted by flies, mosquitoes or insects):

    B. Vehicle borne diseases (from water, food, etc.):

    C. Direct contact (sexually transmitted, etc.):

2. When should antibiotics be used? When are they inappropriate or dangerous?

3. Give at least three environmental factors that contribute to disease and ways in which they may be controlled.

4. Why do immunizations work?

5. Describe two ways of purifying water for drinking or food preparation.

6. Name five ways of maintaining personal hygiene.

TRADITIONAL METHODS OF COOKING: AN INTRODUCTION TO COOKSTOVE TECHNOLOGIES

Total time: 2 hours

Objectives:

* To discuss the need for alternative sources of energy and energy conservation in developing nations
* To describe the advantages and disadvantages of open fire cooking
* To discuss fuel-saving cookstoves and other alternatives to open fire cooking

Resources:

* Aprovecho Institute, Helping People in Poor Countries
* Evans and Boutette, Lorena Stoves
* Eckholm, The Other Energy Crisis: Firewood

Materials: Matches, locally collected fuels (firewood, dung, dried corn stalks, rice hulls, etc.), cooking utensils, cups, water, earthen stoves, stones, hatchet, machete or ax (if needed) and the ingredients for a hot beverage

Procedures: Step 1. (5 minutes)
Present the objectives and list the session activities. Outline the phase schedule.

Trainer Notes

Post a copy of the phase schedule on newsprint to refer to during this presentation.

Step 2. (5 minutes)
Review some of the issues raised in Phase I: Session 14, "Global Energy Issues," and have the participants list some of the results of deforestation.

Trainer Notes

Mention Eric Eckholm's pamphlet, The Other Energy Crisis: Firewood, as a resource describing the results of deforestation on developing nations.

Step 3. (10 minutes)
Have participants list some of the possible ways of addressing the problems of deforestation and fuel wood scarcity.

Trainer Notes

The following approaches should be mentioned: reforestation for fuel wood, erosion control, solar ovens and cookers, retained heat cookers, electrification, other fuels such as biogas, kerosene, coal, natural gas, etc., a change in the politics of wood use (lumber use, slash-and-burn, etc.).

Mention that these responses to fuel scarcity will be discussed in more detail in Session 18 of this phase.

Step 4. (15 minutes)
Discuss the advantages of the use of improved cookstoves as a way of dealing with the problem of firewood scarcity.

Trainer Notes

Explain that there are many responses to deforestation and the lack of fuel, and that improved cookstoves are only one approach. However, they are an approach which has been identified as immediate and appropriate.

Briefly mention some of the advantageous characteristics of improved cookstoves (such as low cost, fuel-conserving, built from locally available materials, easily maintained and repaired, smoke control, more sanitary).

Stress that villagers may have motives other than fuel conservation for accepting improved cookstoves (such as enhanced status and/or smoke control).

Mention how cookstoves only delay the problem -- not solve it. Reforestation and perhaps population stabilization are the final answers.

Step 5. (10 minutes)
Facilitate a discussion of open fire cooking (over rocks, on a grate, in a pit) as a traditional method throughout the world.

Trainer Notes

Ask if anyone has ever cooked on an open fire, or if they have seen it done. If people in the group have traveled, they may be familiar with cooking on an open fire as a traditonal method. Ask them to describe what they saw, the type of fire arrangement and the fuel burned.

Step 6. (45 minutes)
Have participants form small groups and:

* Collect a small amount of fuel from the area.
* Prepare a traditional open cooking fire.
* Bring water to a boil and make a hot beverage to drink.

Trainer Notes

Emphasize that a minimum amount of fuel should be used to simulate a condition of scarcity. If possible, use a fuel that best illustrates the conditions in countries where people will eventually serve. The teams may be formed according to the region of future Peace Corps service.

Step 7. (10 minutes)
Ask each group, while they drink their beverage, to list on newsprint the advantages and disadvantages of open fire cooking that they have gained from this experience. They should also list any additional advantages and disadvantages that might be encountered in a developing country.

Trainer Notes

Be sure a number of categories are included (e.g., safety, efficiency, cost, convenience, impact on health and tradition, social/ceremonial focus, source of heat and light, insect control, etc.) and that specific concerns are discussed (e.g., uneven heat, burns and scalds, fire easily built without practice, easily seen, controlled and moved, accommodation of varying fuel and pot sizes, need for constant tending, health hazards, smoke, much heat not directed to pot, fire doesn't hold heat, etc.).

Step 8. (10 minutes)
Reconvene the groups. Have them post their lists and briefly review them. Ask how the ideas listed could be incorporated into making improvements on the open fire method of cooking. Record any suggestions on newsprint.

Trainer Notes

All suggestions should be welcomed, reviewed and discussed for cultural sensitivity and feasibility. Some ideas may not work but it is important that people begin to imagine how existing and indigenous technologies may be used as a basis for modifications, rather than assuming a new technology must be introduced. Suggestions include: methods to control air flow, directing and retaining heat more efficiently, reducing hazards, eliminating smoke, orienting wind, using wind breaks, placing lids on pots, enclosing fire, controlling height of pot, etc.

Step 9. (10 minutes)
Conclude the session by reviewing the variety of approaches that may be taken to improve cooking methods and to save fuel.

Trainer Notes

Mention that in some cases, improved use of open fires can result in significant fuel savings.

Point out the importance of respecting tradition and of encouraging people to identify their problems and propose the solutions based upon their own experiences. Ask for comments and observations about the session.

* Were the objectives met?
* Did people learn about issues, examine advantages and drawbacks, etc?

Fires should be completely doused, the area cleaned and utensils stored before participants move on to another activity.

FUEL-SAVING COOKSTOVES: GATHERING INFORMATION

Total time: 1-1/2 hours

Objectives: To discuss the range and complexity of issues and factors to be considered when investigating the need for the promotion and/or development of new technologies

Resources: "Socio-Cultural and Technical Checklists," Helping People in Poor Countries, pp. 31-34

Materials: Newsprint and felt-tip pens

Procedures: Step 1. (30 minutes)
Begin by stating the session objectives. Then ask the participants to divide into groups of 4 or 5 in order to consider the following question:

> As community development facilitators, what information would you need and what factors would you want to be aware of before deciding that there was a need for helping people improve or change the ways they cook?

Trainer Notes

An effective procedure for considering this question is to have each group draw two columns on newsprint -- one for socio-cultural factors and the other for technical information Then ask the groups to list their responses to the question in the two columns.

Both the discussion question and the instructions for this activity should be posted on newsprint to provide participants with focus and clarity while they are working in their groups.

Step 2. (30 minutes)
Reconvene the groups and ask a representative from each group to present their lists. Facilitate any questions or discussion raised by the lists.

Step 3. (5 minutes)
Distribute copies of pp. 31-34, "Socio-Cultural and Technical Checklists" from Helping People in Poor Countries and allow participants time to review the material.

Step 4. (15 minutes)
Referring to the checklists, ask participants to identify and discuss any factors that were not covered in the earlier lists.

Step 5. (10 minutes)
Ask that a volunteer participant(s) facilitate a discussion which reviews and summarizes the session.

Trainer Notes

In summarizing the session, these key issues should be highlighted:

- The importance of appreciating the complexity surrounding the promotion and development of a new technology
- The significance of social-cultural awareness and sensitivity in the assessment of needs
- The understanding that the promotion/development of cookstove technology (or any other technology) may not always be the answer

COOKSTOVE DESIGN AND INNOVATIONS

Total time: 2-1/2 hours

Objectives:

- To compare and contrast a variety of traditional and improved cookstove designs
- To practice designing cookstoves
- To discuss available resource material on cookstove technology

Resources:

- Farallones/Aprovecho slide presentation, "Indigenous and Improved Cookstove Technologies from Around the World"
- Attachment II-4-A, "Hypothetical Design Situations"
- Attachment II-4-B, "Catalogue" from Cookstove News, Vol. I, No. 1
- Aprovecho Institute, Helping People in Poor Countries
- Evans & Boutette, Lorena Stoves

Materials: Projector and screen, chalkboard/chalk or newsprint and felt-tip pens

Procedures: Step 1. (1 hour)
Provide a brief overview of the session objectives and present the slide show, "Indigenous and Improved Cookstove Technologies from Around the World."

Trainer Notes

The slide show presentation will expose the participants to a variety of cookstoves that have been built and used worldwide. The program is designed to stimulate the participants' thinking about different cookstove innovations before they begin actual design and construction.

Don't dwell too long on any slide. Just briefly explain the origin of the stoves and the location of firebox and tunnel systems.

Step 2. (30 minutes)
Ask the participants to form four design groups. Assign each design group one of the hypothetical design situations outlined in Attachment II-4-A, "Hypothetical Design Situations," and ask them to prepare an explanation and a drawing of their cookstove design on newsprint, showing top and side views.

Trainer Notes

Circulate among the groups, providing hints and suggestions regarding their cookstove designs. Let them work it out themselves. Ideas are more important at this point than technical feasibility.

Step 3. (30 minutes)
Reconvene the groups. Ask each group to present their design. Facilitate any discussion which may arise.

Step 4. (20 minutes)
Distribute Attachment II-4-B, the "Catalogue," and facilitate a discussion of the various cookstove models shown as well as the models seen in the slide show.

Trainer Notes

Explain the Spanish term "lorena" and its significance in this program:

"Lorena" refers to a sand/clay stove and a stove construction process. It also refers to a specific stove model, developed for use in highland Guatemala. It is the sand/clay mix and not the particular stove design that will be emphasized during this training phase.

Step 5. (5 minutes)
Distribute copies of Helping People in Poor Countries and Lorena Stoves. Present any other resource materials on cookstove technology or charcoal production that will be available during the training program.

Step 6. (5 minutes)
Conclude the session by reviewing the objectives and facilitating a brief discussion of how effectively they were met.

HYPOTHETICAL DESIGN SITUATIONS

Design Situation #1

* Hot tropics. It rains about three months of the year.

* Cooking is done outside, except during the rainy season.

* Fuel is charcoal.

* Morning meal: thin gruel or warmed leftovers.

* Mid-day and evening meals:

  One pot, 40cm diameter and made out of cast aluminum, is used for a mush of sweet potatoes or millet which must be stirred constantly.

  A second pot, 25cm diameter and made out of cast aluminum, is used for a sauce or soup made of onions and meat or fish fried together, with vegetables added later and all simmered together like a stew.

* People drink tea after meals and between meals but not during meals.

Design Situation #2

* Highland tropics. Nights are cool; days are warm. It rains in the afternoon about six months of the year.

* Outdoor market stall: Food is cooked in the morning and kept warm while it is served during the course of the day (from about 10 a.m. to 4 p.m.).

* Fuel is firewood (small sticks to pieces about 4" thick and 18" long).

* Items cooked: rice, beans, sauces, meat stew, soup, tortillas and coffee. All foods are cooked in earthenware pots of various sizes, most with rounded bottoms. Tortillas are cooked on a large clay griddle and coffee is heated in a metal teakettle.

* As many of these foods as possible should be ready to serve at any one time.

Design Situation #3

- Very cold arctic climate, with 8 or 9 months of snow and cold.
- Cooking is done indoors. Excess heat from cooking is needed for warmth.
- Fuel is small sticks and driftwood. There are no trees in the area.
- Morning meal: pancakes and tea. Pancakes are cooked on an iron griddle.
- Mid-day and evening meals:

  Meat stew, leftover pancakes and tea. Stew is cooked in a large iron pot and tea in a tea kettle with a flat bottom.
- Tea is often served during the day and evening.
- Once or twice yearly, great quantities of whale blubber are rendered in a very large (60cm diameter) iron kettle.

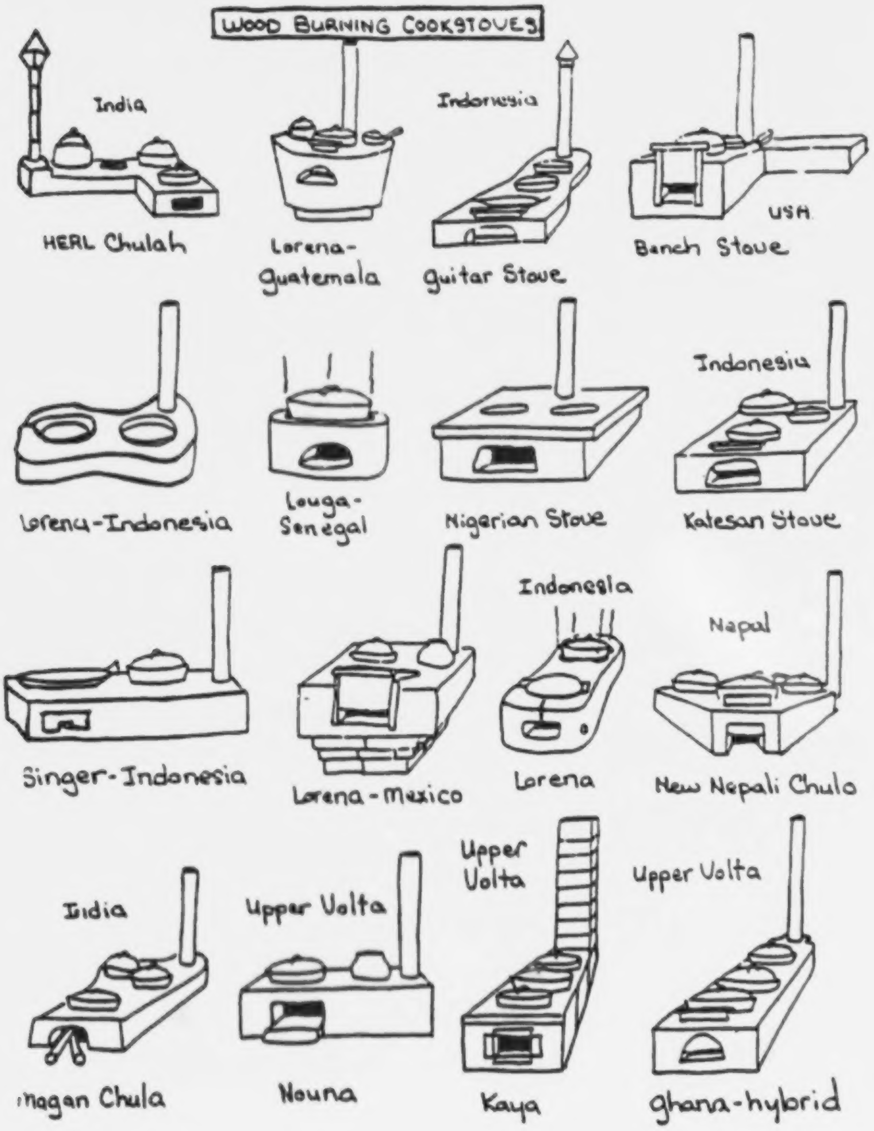
Design Situation #4

- Northern desert climate. Summers are hot and dry; winters, cold and dry.
- Semi-nomadic people who cook outdoors when they camp in tents for seven months of the year. During the winter (5 months), they cook indoors while living in huts.
- Fuel is brush and small twigs. Fuel is scarce.
- Morning meal: cold leftovers.
- Mid-day and evening meals:

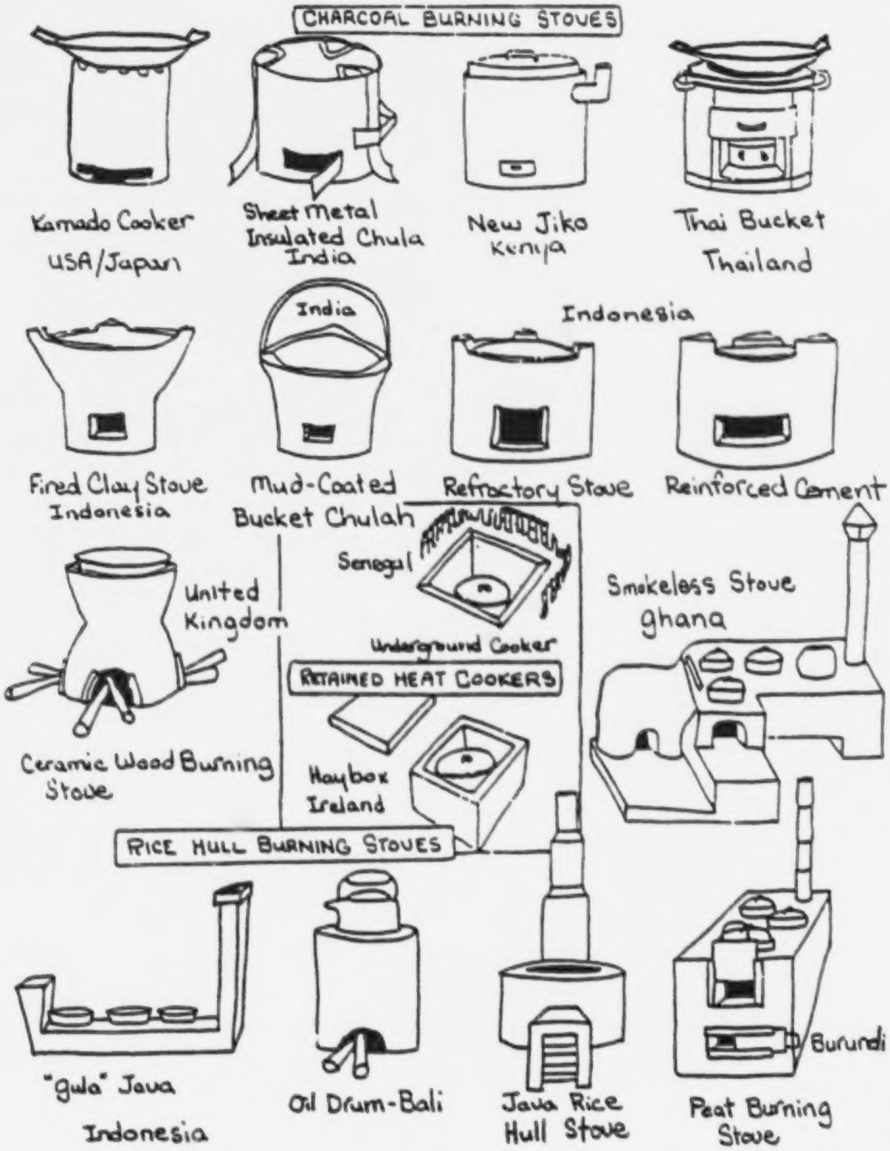
  Porridge from grass seeds, stew from wild tubers and vegetables and occasionally meat or pancakes from acorn meal. They use metal pots and griddle.
- Warm water is used for washing, especially in winter.
- Tea is drunk after dinner and when visiting friends.

CATALOGUE FROM COOKSTOVE NEWS, VOL. 1/NO. 1

Catalogue


WOOD BURNING COOKSTOVES
India
HERL Chulah
Lorena-Guatemala
Indonesia
Guitar Stove
USA
Bench Stove
Lorena-Indonesia
Louga-Senegal
Nigerian Stove
Indonesia
Katesan Stove
Singer-Indonesia
Lorena-Mexico
Indonesia
Lorena
Nepal
New Nepali Chulo
India
magan Chula
Upper Volta
Nouna
Upper Volta
Kaya
Upper Volta
ghana-hybrid

CATALOGUE FROM COOKSTOVE NEWS/Continued:


CHARCOAL BURNING STOVES
Kamado Cooker
USA/Japan
Sheet Metal
Insulated Chula
India
New Jiko
Kenya
Thai Bucket
Thailand
India
Indonesia
Fired Clay Stove
Indonesia
Mud-Coated
Bucket Chulah
Refractory Stove
Reinforced Cement
Senegal
Underground Cooker
United
Kingdom
Smokeless Stove
Ghana
RETAINED HEAT COOKERS
Ceramic Wood Burning
Stove
Haybox
Ireland
RICE HULL BURNING STOVES
Burundi
"Gula" Java
Indonesia
Oil Drum-Bali
Java Rice
Hull Stove
Peat Burning
Stove

These are only a few examples of improved cookstoves. Details and contact people available from Cookstove News/Aprovecho Institute.

THINKING IN PICTURES: INTRODUCTION TO DESIGN DRAWING

Total time: 2 hours

Objectives:

- To discuss basic concepts of mechanical and perspective drawing
- To do a sample mechanical and perspective drawing
- To discuss the effectiveness of mechanical drawing as an appropriate aid to communication

Resources:

- Ching, Architectural Graphics, pp. 44-45, 67-69
- Lockard, Design Drawing Experiences

Trainer Notes

Copies of pages 44-45 and 67-69 from Architectural Graphics should be prepared for distribution during this session.

Materials: Soft lead drawing pencils, drawing paper, graph paper, newsprint and felt-tip pens or chalkboard/chalk

Trainer Notes

Ask participants with experience in drafting and three-dimensional drawing to act as co-facilitators for this session. Their roles might include assistance in session preparation, group facilitation or assisting those individuals having difficulty with the drawings. If one of the participant/co-facilitators has a great deal of experience in drafting/drawing, ask that he/she assist in presenting the session.

Meet with the co-facilitator(s) at least 24 hours before doing the session. Give each of them a copy of the session procedures and resource material. Be certain that they thoroughly understand what their roles will be. (See Steps 4 and 5.)

Procedures:

Step 1. (5 minutes)
Review the session objectives and distribute the resource materials.

Step 2. (20 minutes)
Discuss and demonstrate basic mechanical drawing concepts.

Trainer Notes

- * Demonstrate the concepts of plan, elevation, section and the conventions of line width and shading.
- * Draw these concepts on newsprint or on a chalkboard as they are discussed.
- * Have the participants copy and practice drawing the concepts.
- * Encourage questions and discussion.

Step 3. (20 minutes)
Demonstrate and discuss basic concepts of perspective drawing.

Trainer Notes

- * Sketch and explain examples of one and two-point perspective, eye-level and shading.
- * Have the participants copy and practice drawing your examples.

Step 4. (40 minutes)
Have the participants form drawing groups and do a sample mechanical drawing.

Trainer Notes

Have each group draw the following:

- * Plans, elevations and sections of an object
- * A perspective drawing of the same object, using shading

There should be one co-facilitator with each drawing group to offer advice and assistance.

The co-facilitators can also be of assistance in selecting simple objects to draw (i.e., a solar dryer, breadbox water heater, a Lorena stove) and arranging the locations in which to draw them.

Step 4. (5 minutes)
Have the groups return and form new groups such that each of the new groups has only one person from each of the original drawing groups.

Trainer Notes

The co-facilitators should assist in forming the new groups by going to different parts of the room and asking the groups to form around them.

Step 6. (15 minutes)
Have the members of these new groups share and explain their drawings with one another.

Step 7. (15 minutes)
Reconvene the entire group and have participants discuss the use of mechanical drawings within the context of overseas development work.

Trainer Notes

Some questions for this discussion include:

* Can mechanical drawing be an effective aid in communicating new technologies to Third World people?

* What difficulties might arise in using a mechanical drawing to explain or demonstrate a technical concept?

* How could the drawings be modified to address these difficulties?

Mention that there will be a more extensive discussion of appropriate aids to communication in Phase III: Session 6.

INTRODUCTION TO INDEPENDENT STUDY

Total time: 2 hours

Objectives:

* To clarify and discuss the independent study component of the training program

* To identify and list possible uses for independent study time

Resources: Schedule of the training program

Materials: Newsprint and felt-tip pens or chalkboard/chalk

Trainer Notes

* Independent study periods occur throughout Phases II through V (See "Phase Calendars"). In each of these phases, approximately four hours(16 hours throughout the program) have been allotted to allow participants the opportunity to structure and use their own time independently.

* Ask that a participant volunteer facilitate this session. Brief him/her in advance regarding the session procedures and be sure to leave time at the end of the session to discuss the effectiveness of the facilitation skills.

Step 1. (10 minutes)
Review and discuss the session objectives, explaining the goals and some potential uses for independent study time.

Trainer Notes

* Explain that as Peace Corps volunteers, much of the participants' time will be unstructured and that they will often have to make their own decisions regarding its productive use.

* Mention the wide range of varied and potentially-useful interests of the group which may go beyond the scope of the limited time frame of this training program. For this reason, time is allowed for pursuing these interests through independent research and study.

* Point out that at the end of Phase II, time can be made available for participants to share the results of their independent study through presentations, skits, discussions or whatever medium they choose.

Continued

Trainer Notes/Continued

- * It should be stressed, however, that the use of independent study periods depends upon the participants and their own sense of a productive use of time. It should not be highly goal-oriented, due to any sense of obligation. Goals should be set only if the participant determines they are necessary.

Step 2. (20 minutes)
Brainstorm a list of possible uses for independent study time, listing suggestions on newsprint.

Trainer Notes

You can assist by suggesting the following potential uses:

- * To pursue further reading and research on topics that have been presented during training
- * To investigate topics that have not been covered
- * To organize or continue group meetings or discussions which generate from training or independent research
- * To develop a special project, either independently or with a group

Step 3. (1 hour, 30 minutes)
Have participants use the time remaining to begin their independent work.

COOKSTOVE OPERATION, FUNCTION AND DESIGN PRINCIPLES

Total time:	2 hours
Objective:	* To operate a fuel-saving sand/clay cookstove * To discuss the principles of heat transfer and heat loss * To discuss the design principles for energy-saving cookstoves
Resources:	* Attachment II-7, "Questions for Stove Operation" * Aprovecho Institute, Helping People in Poor Countries, pp. 77-84 * Evans and Boutette, Lorena Stoves, pp. 20-26 * Large format illustration of a two-pot, two-damper, sand/clay cookstove * Illustrations of heat transfer and heat transfer within a cookstove

Trainer Notes

These illustrations should be prepared before beginning the session.

Materials: Fuel, matches, grain and beverage utensils, examples of fuel-saving sand/clay cookstove(s), newsprint and felt-tip pens.

Trainer Notes

* For this session you will need to have operating examples of fuel-saving sand/clay cookstoves. A dampered singer or concrete stove could be built for this session, due to their quicker construction and drying time.
* After the session and during the remainder of the training, you should encourage the participants to use the cookstoves (as well as open fires) in preparing their daily meals.

Step 1. (5 minutes)
Present the session objectives and outline the activities.

Step 2. (5 minutes)
Describe and explain the basic functions of the fuel-saving sand/clay cookstove.

Trainer Notes

Indicate and describe the function of the cookstove baffles, damper, tunnel (flue) and chimney.

Step 3. (5 minutes)
Distribute Attachment II-7, "Questions for Stove Operation," and have the participants read it.

Step 4. (1 hour)
Ask the participants to form groups and:

1. Collect fuel and prepare a grain and beverage on their sand/clay cookstove.
2. Select a group member to record the answers from the attachment questions and to note the group's discoveries regarding stove operation for later discussion.

Step 5. (15 minutes)
Reconvene the groups and ask them how it felt to operate the stoves without previous instruction. Facilitate a brief discussion.

Trainer Notes

An important point to raise during this discussion is that often stove programs (as well as development programs in general) introduce a new technology concentrating on construction, with little attention to training the users in operation and maintenance. In the case of cookstoves, people will be able to operate the stove only as they understand it. It is possible that they will not operate it as it was designed to function and, therefore, will not gain its full benefit. Likewise, if the stove is damaged, they may be unable to repair it. Mention that these issues will be covered in more detail and that it is of utmost importance to remember to involve the stove users in all steps of the development process.

Step 6. (15 minutes)
Referring to the attachment questions as guidelines, discuss air flow within the stove, starting and maintaining a fire and the effect of the dampers.

Trainer Notes

Post the illustration of the two-pot cookstove and use it to indicate the sequence for starting and maintaining a fire.

Step 7. (20 minutes)
Discuss the three types of heat transfer.

Trainer Notes

* Ask the participants to define radiation, conduction and convection.

* Encourage the participants to illustrate their definitions with examples gained from their experience with the cookstoves.

* Discuss ways in which radiation, conduction and convection work for and against cookstoves.

* Ask where radiant, conductive and convective heat losses occur in the stove.

* Ask for examples of possible ways to minimize heat loss in stoves.

* Post the illustrations on heat transfer and heat loss and use them for reference during the discussion.

* Refer to pages 77-84 of Helping People in Poor Countries (See Resources) for background information on heat loss and heat transfer.

Step 7. (5 minutes)
Ask the participants to read pages 20-26 in Lorena Stoves.

Step 8. (20 minutes)
Facilitate a discussion on stove design, listing the important points.

Trainer Notes

* Briefly review the twelve essential design guidelines found on pages 20-26 of Lorena Stoves.

* Mention the importance of understanding these design guidelines and the principles of heat transfer and loss before constructing a stove.

QUESTIONS FOR STOVE OPERATION

A. Draft: Dampers, Flues, Chimneys

1. Does there appear to be too much draft or too little?
2. How does the front damper affect the fire and function of the stove?
3. How does the back damper affect the fire and function of the stove?
4. How do baffles affect the flow of gases?
5. How do tunnel dimensions and tunnel condition affect the flow of gases?
6. What about chimney height? Diameter?

B. Cooking

1. Was there too much or too little heat to do the cooking task?
2. How much heat was at each pothole? (Amount of time to come to boil; length of boil; could you fry on potholes #2 and #3?)

UNDERSTANDING THE COOKSTOVE DESIGN PROCESS AND SOIL MIXES

Total time: 1 hour, 30 minutes

Objectives:

* To design a fuel-saving cookstove
* To discuss the importance of user input in the design process
* To discuss the principles of sand/clay ("Lorena") mixes

Resources: Evans and Boutette, Lorena Stoves, pp. 28-50

Materials: Pots, pans, lids, sand, clay, containers of different soil types, screens (filters), buckets, shovels, hoes, and water

Trainer Notes

This session requires preparation. Step 2 asks for three separate trainers to run through the three suggested roles. These trainers should be familiar with the particular stove design on which their roles will be focusing (See Trainer Notes under Step 2 for more specific information on the role-playing procedure).

Procedures:

Step 1. (5 minutes)
Review the session objectives and activities.

Step 2. (45 minutes)
Ask the participants to form three work groups. Introduce the three trainers who are playing the role of "villagers." Explain that each group should join one of the "villagers" to assist in assessing his/her needs regarding stove design.

Trainer Notes

Three types of cookstoves are suggested as the basis for the role playing: the Lorena, the Louga and the Java Chimneyless (See pages 28-38 of Lorena Stoves). These stoves were selected because they originated in three different parts of the world and their designs incorporate specific cultural and environmental needs.

Continued

Trainer Notes/Continued

Each of the three trainers to be involved in the role playing should be thoroughly versed with one of these cookstoves and their cultural/environmental origins. Each trainer should be prepared to play the role of a villager from the country of origin of his/her cookstove. For example, the trainer responsible for the Lorena Stove would play a highland Guatemalan villager, reflecting that particular stove's origin.

Each "villager" should have pots and pans of the type and size used to design the particular stove and any other props that could add to the authenticity of the role-playing situation (i.e., dressing as a Guatemalan villager).

The idea is for the "villager" to manifest needs that will lead the work groups to discover the particular design suited to those needs (for instance, the Lorena for the Guatemalan highlander). The villager should try not to "give away" the stove design and allow the work groups to experience designing the stove with the villager's participation. It may be necessary for the trainer to occasionally step out of the role of the villager to help explain certain technical points during the conversation. This design process should involve drawing the stove layout on the ground and arranging the pots according to the design principles discussed in the previous session and on pages 28-50 of Lorena Stoves.

Explain that each of the work groups will continue the process by actually building and using the stove they and the "villager" have designed.

Step 3. (20 minutes)
Reconvene the work groups and discuss soils and soil mixes.

Trainer Notes

The following questions may help stimulate discussion:

- What do you remember about soils from the earthen block session?
- What are the three components of soil?
- What distinguishes one type of soil from another?
- What are the characteristics of clay, sand and silt? How do they feel?
- How and where would you find clay? Sand?

Have containers of different soil types available to circulate so that people can feel and see the difference.

Continued

Trainer Notes/Continued

Conduct the soil tests for clay, if they haven't already been completed in the session on earthen blocks (see pages 42-44 of Lorena Stoves for details).

Distinguishing between usable and unusable clays is important. Make and fire clay balls to demonstrate that good clay holds together and poor clay flakes apart.

If time permits, conduct a field-walk to clay and sand deposits.

Step 4. (20 minutes)
Facilitate a discussion on clay/sand ("Lorena") mixes.

Trainer Notes

Guide the discussion with the following questions:

- What roles do sand and clay play in a mix?
- How would you test for a good sand/clay mix?

Have sample clay/sand mixtures of different proportions available so that participants can see and feel the differences. It is helpful to have dried test blocks available.

Refer the participants to pages 47-49 of Lorena Stoves and discuss the different tests for determining the suitability of the sand/clay mixtures for stove construction. These tests are: test blocks (make some to test later), the palm, ball tests (do during the session) and model stoves.

Mention that there will be ample opportunities during the following construction sessions to develop a feel for the correct mix of sand and clay.

INSOLATION METER CONSTRUCTION

Total time: 2 hours

Objectives:

- To build and use a simple insolation meter
- To begin to gather data on insolation for future application to solar projects

Resources:

- Anderson, Bruce, The Solar Home Book, pp. 58-62, 173-174
- Mazria, Edward, The Passive Solar Energy Book, pp. 13-20
- Baer, Steve, Sunspots, pp. 118-125
- Attachment II-9-A, "Insolation Meter Data Collection Sheet"
- Attachment II-9-B, "Insolation Meter"

Materials: Newsprint and felt-tip pens, metric scale 0-30 kg, thermometers (0°C), tape (or other fasteners), saws or knives, insulating material (rigid foam insulation, straw, newspaper, etc.), clear glazing material (glass, vinyl, etc.), 20-liter tin cans or other containers, flat black paint, paint brushes, paint thinner, sample insolation meter

Procedures:

Step 1. (10 minutes)
Begin the session by posting the words "Insolation Meter" on newsprint and asking the participants to define "insolation" and "insolation meter."

Step 2. (5 minutes)
Facilitate a brief discussion of the terms "units of insolation" and "kilogram calorie," and provide an overview of the different units of measuring insolation in different countries.

Step 3. (5 minutes)
Display the sample insolation meter. Have the participants discuss how to locate and align the insolation meter.

Trainer Notes

It is important that the participants discuss these three basic guidelines for location and alignment:

Continued

Trainer Notes/Continued

The insolation meter should:

1. Be placed in a good potential solar site with maximum exposure to the sun year-round.
2. Face the equator;
3. Be tilted to maximize insolation (See Phase III: Session 2, "Path of the Sun").

Step 4. (5 minutes)
Explain the basic guidelines for collecting data from an insolation meter.

Trainer Notes

Point out that in order to collect data from the insolation meter:

* The glazing area should be covered, with the exception of a one or two hour period when data are being collected.
* The insolation meter works best at low water temperatures and for short exposure periods (overheated water and heat loss from the meter will cause the data to be misleading).
* Water temperatures should be recorded twice during each test period -- at the beginning and at the end. The difference between these two temperatures is referred to as "T" or "Delta Tee."
* Data should be recorded on the "Insolation Meter Data Collection Sheet."

Step 5. (10 minutes)
Distribute Attachment II-9-A and allow time for the participants to review it as well as the accompanying sample sheet.

Trainer Notes

Review each step of the sample sheet with the participants, answering any questions. Explain that they should be recording their data over the next several weeks and that this data will be applied during the solar phase of the training program.

Step 6. (90 minutes)
Distribute Attachment II-9-B, "Insolation Meter " Have the participants form small work groups of 2 to 4 people and build and place an insolation meter.

Trainer Notes

Be sure there are adequate building materials for each work group. Post the following checklist for the construction and use of an insolation meter:

_____ Paint at least one face of the can flat-black.

_____ Fill the can no more than 90% full to allow for expansion of the water.

_____ Weigh the can full of water in kilograms.

_____ Seal the box tightly.

_____ Be certain the glazing is well-sealed.

_____ Measure the collection aperture in square meters.

_____ Be sure the thermometer can be read without dismantling the meter.

_____ Be sure the meter is properly oriented.

_____ Be sure the meter is properly tilted.

_____ See that the glazing can be completely covered at night.

INSOLATION METER DATA COLLECTION SHEET

Name:
Location:
Orientation (compass direction):
Tilt (degrees from horizontal):
Weight (in kilograms):
Aperture (in square meters):
Weight/Aperture:

Date	Weather Conditions	Time	Temp (^{o}C)	$\frac{\Delta t}{hr}$	$\frac{Kgcal}{m^2\,hr}$	$\frac{\Delta t}{day}$	$\frac{Kgcal}{m^2 day}$

Hourly Insolation:

$$\left(\frac{Kgcal}{m^2/hr}\right) = \frac{\text{Weight (kg)} \times \Delta t/hr \ (^{o}C/hr)}{\text{Aperture of meter } (m^2)}$$

Daily Insolation:

$$\frac{Kgcal}{m^2/day} = \frac{\text{Weight (kg)} \times \Delta t/hr \ (^{o}C/day)}{\text{Aperture of meter } (m^2)}$$

Note that weight and aperture are constants. The only variable is Δt. Therefore, to find insolation, multiply weight/aperture by the Δt.

INSOLATION METER DATA COLLECTION SHEET

Name:
Location:
Orientation (compass direction): True South
Tilt (degrees from horizontal): 45°
Weight (in kilograms): 20
Aperture (in square meters): 0.1
Weight/Aperture: 200

SAMPLE

Date	Weather Conditions	Time	Temp (°C)	Δt / hr	Kgcal / m² hr	Δt / day	Kgcal / m²day
6-10	Clear	8 AM 9 AM	16 17	1	200		
6-11	Clear	9 AM 10 AM	16 18	2	400		
6-12	Clear	10 AM NOON	16 22	3	600		
6-13	Cloudy						
6-14	Clear	11 AM NOON	16 19	3	600		
6-15	Clear	NOON 1 PM	17 21	4	800		
6-16	Clear	1 PM 3 PM	17 26	4.5	900		
6-17	Clear	2 PM 3 PM	18 21	3	600		
6-19	Clear	3 PM 4 PM	17 19	2	400		
						22.5	4500

Hourly Insolation:

$$\left(\frac{\text{Kgcal}}{\text{m}^2/\text{hr}}\right) = \frac{\text{Weight (kg)} \times \Delta t/\text{hr} \ (^{\circ}\text{C/hr})}{\text{Aperture of meter (m}^2)}$$

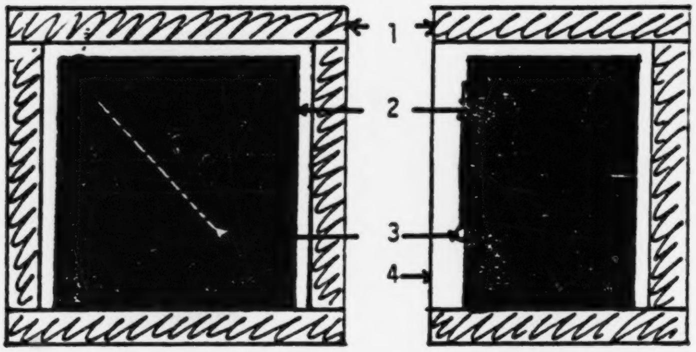
Daily Insolation:

$$\frac{\text{Kgcal}}{\text{m}^2/\text{day}} = \frac{\text{Weight (kg)} \times \Delta t/\text{hr} \ (^{\circ}\text{C/day})}{\text{Aperture of meter (m}^2)}$$

Note that weight and aperture are constants. The only variable is Δt. Therefore, to find insolation, multiply weight/aperture by the Δt.

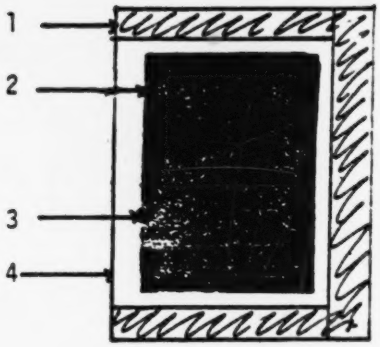
INSOLATION METER

Front View Side View



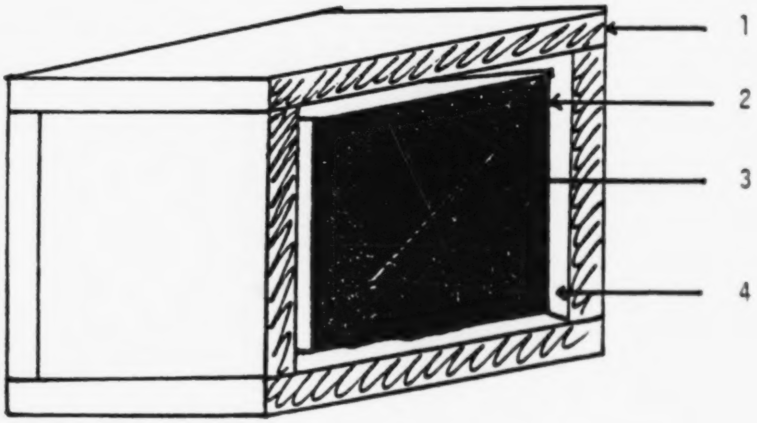
KEY

1. Insulation
2. Black-painted can
3. Thermometer
4. Glazing



Top View

Isometric View



COOKSTOVE CONSTRUCTION
PART 1: CONSTRUCTING THE BASE

Total time: 1 hour

Objectives:

- To build a sand/clay cookstove as described in the previous session
- To construct the base of a sand/clay cookstove (optional)

Resources: Evans and Boutette, Lorena Stoves, pp. 50-51

Materials: Clay, sand, water, rubble, earthen blocks/brick/concrete rubble/soil-cement blocks/mortared rocks, sifter, shovel, hoe, machete, trowel, lumber

Procedures: Step 1. (1 hour)
Ask the participants to form the same work groups as in the previous session and to lay out and construct an appropriate stove base using the materials provided.

Trainer Notes

Each group should construct a base for one of the three suggested cookstoves to be built during this phase: the Lorena, the Louga and the Java Chimneyless.

Explain that the stove base should be solid and not shift. Also mention protecting the base from erosion due to surface runoff of water.

Give participants a variety of suggestions, i.e., a level ground base, clay-mortared earthen blocks, cinder blocks, etc.

Encourage the groups to be creative in their use of materials and to try new approaches. Explain that they should feel free to do this at all stages of the stove construction.

Before the groups begin construction, mention that they should limit the size of their stove (generally the largest being two pots with a chimney) to be certain there will be time to complete the project.

COOKSTOVE CONSTRUCTION
PART 2: BUILDING THE STOVE MASS

Total time: 6 hours

Objective: To construct the mass of a sand/clay cookstove

Resources: Evans and Boutette, Lorena Stoves, pp. 50-57

Materials: Clay, sand, water, sifter, machete, trowels, shovels, hoes, tampers, lumber

Procedures: Step 1. (6 hours)
Have the work groups construct the stove masses.

Trainer Notes

Tell the work groups they have six hours to complete the stove.

Outline the procedure for building the stove bodies in the following manner:

- Sift sand and clay through a 5mm or 3mm (3/16" or 1/8") screen mesh.
- Mix the dry ingredients to the desired proportions.
- Add water and mix well.
- Apply the mixture to the stove base.
- Add one layer to another, packing each layer well, paying special attention to the edges and being careful to keep the sides straight.
- Continue adding layers until the stove mass attains a height of 30-40cm, depending upon the depth of the pots to be used and the height of the firebox.
- Trim the stove mass sides and fill in mixture where needed.
- Level the surface by gently pulling a wet board back and forth over the surface until it is flat and smooth.

Circulate among the work groups and assist them in the construction process where necessary. Encourage group members to rotate tasks in order to gain experience in all phases of the construction.

Ask the participants to read Lorena Stoves, pp. 58-65, before the next session.

COOKSTOVE CONSTRUCTION
PART 3: FINISHING THE COOKSTOVE

Total time:	3 hours
Objective:	To excavate the potholes and tunnels of an earthen cookstove
Resources:	Evans and Boutette, Lorena Stoves, pp. 58-65
Materials:	Machete, trowel, spoons, nails, sheet metal, wood (for dampers) and chimney pipe (if required)
Procedures:	Step 1. (3 hours) Briefly review the process of excavating and finishing an earthen cookstove. Have participants form their work groups and complete their stoves.

Trainer Notes

Mention that they have three hours to complete their stoves.

Outline the process in the following manner:

- Using the actual pots as templates, position and mark the potholes.
- Locate and mark the position of the damper slot and chimney hole (if necessary).
- Cut the damper slots with a machete.
- Carve out the potholes and chimney with a spoon.
- Cut the firebox entrance and connecting tunnels to the last pothole or chimney hole.
- Finish the potholes with spoons and by rotating the wet pots so that the pots are deeply sunken.
- Build up the baffles under the second and third potholes.
- Construct and insert the dampers.
- Smooth the stove surfaces.

Circulate among the groups offering assistance where necessary.

Refer the work groups to Lorena Stoves, pp. 58-65, for more specific information on completing the stoves.

NATURE OF VOLUNTEERISM: EXPECTATIONS BEYOND TRAINING

Total time: 2 hours

Objectives:

- To discuss and clarify expectations regarding future Peace Corps service
- To plan, carry out and evaluate a training activity using a format for training design

Materials: Newsprint and felt-tip pens

Trainer Notes

The basic format for this session is the same as the format for Phase I: Session 5, "Development of Facilitation Skills Criteria." You should review Session 5 before beginning this one.

Step 1. (5 minutes)
Begin by explaining the session objectives and reviewing the procedures. Encourage questions and discussion.

Trainer Notes

Explain that the procedures for this session are essentially the same as the procedures for the session on the development of criteria for facilitation skills. As in the previous session, participants will be involved in two processes simultaneously. That is, they will be planning, carrying out and evaluating a training activity while discussing and clarifying some of their expectations regarding future Peace Corps service.

Step 2. (10 minutes)
Post the training design format and explain how it will be used in this session.

Trainer Notes

Post the following training design format:

1. Identify and agree upon objectives.
2. Identify available resources.
3. Design an activity/ies to meet the objectives.
4. Evaluate the success of meeting the objectives.

Explain that the remaining steps in this session will consist of using this format to enable participants to discuss and clarify some of their expectations regarding future Peace Corps service.

Step 3. (10 minutes)
Assist the group in identifying and agreeing upon some specific objectives which focus on the general goal of discussing expectations regarding future Peace Corps service. List these objectives on newsprint.

Step 4. (10 minutes)
Help participants identify any resources which may be available.

Trainer Notes

Some resources might include: returned Peace Corps Volunteers, current volunteers, written statements by current or ex-volunteers, films or books about Peace Corps service, etc.

Step 5. (15 minutes)
Have participants design an activity/ies which meets their objectives and utilizes the available resources.

Trainer Notes

- Activities which you can suggest include: a panel discussion with current or returned volunteers, a brainstorm and discussion of expectations, small group discussions, etc.
- Suggest that the procedures for the activity be outlined, that time limits be set and that a timekeeper, recorder, observer and facilitator be chosen.

Step 6. (60 minutes)
Have participants carry out the activity according to their design.

Step 7. (10 minutes)
Evaluate the success of meeting the objectives of the activity.

Trainer Notes

Encourage discussion by asking the following questions:

- Was the activity well designed? If so, how? If not, how could it have been improved?
- In carrying out the activity, were the procedures followed?
- What were some things that the facilitator did to help the process? What did he/she do that hindered?

FOOD ISSUES

Total time: 2 hours

Objectives:

- To compare and contrast the typical diet of the United States with that of diets in developing countries
- To define and discuss cash cropping and subsistence farming
- To identify and discuss a "food first" approach

Resources:

- Werner and Bower, Helping Health Workers Learn
- Gussow, The Feeding Web, pp. 122-125, 163-166, 168
- Bullfrog Films, "Toast"
- Institute for Food & Development Policy, "Food First," a sound slide show

Materials: Newsprint and felt-tip pens, chalkboard/chalk, film projector and tape recorder

Procedures:

Trainer Notes

- Have the participants read the listed resources prior to the session. If copying is not possible, place the resources on reserve and have a scheduled check-out system so that participants can review the materials.
- If they are not available, the film ("Toast") and slide show ("Food First") mentioned in Steps 4 and 6 can be substituted with analysis of related reading.

Step 1. (5 minutes)
Present the session objectives and outline the activities.

Step 2. (15 minutes)
Have the participants brainstorm a list of qualities and meanings for the word "food."

Trainer Notes

Write their responses on posted newsprint (e.g., "Food" is . . nutrient, commodity, healing, sharing, sacred, festive, weapon, power, symbolic, etc.)

Step 3. (15 minutes)
Assist the participants in generating and comparing lists of foods that could be considered "typical" in the United States and "typical" in developing countries.

Trainer Notes

Post the two lists on newsprint and discuss significant similarities and differences.

Have the participants identify and discuss those foods typical to the United States that are healthful and nutritious and those that are not.

Stimulate discussion by asking:

* How has the typical United States diet changed over the last two generations? Why has it changed?

* Has the typical diet of developing countries changed? Why? Why not?

Step 4. (20 minutes)
Show and discuss the film, "Toast."

Step 5. (15 minutes)
Have the participants define and compare "cash cropping" and "subsistence farming."

Trainer Notes

Write the definitions on newsprint. You can focus the activity by using the following categories: purpose, goal, effects, energy use, sustainability, etc.

Refer participants to the lists of qualities and meanings from Step 2 and ask how they relate to the two approaches.

Step 6. (45 minutes)
Present and discuss the slide show, "Food First."

Trainer Notes

The following questions will focus the discussion:

* What are the implications of "food as commodity" approach to health and well-being?
* How is a "food first" approach possible?
* What are some ways appropriate community technologies can further a "food first" approach?

Step 7. (5 minutes)
Conclude by reviewing the session objectives.

THE ROLE OF THE VOLUNTEER IN DEVELOPMENT: DEFINITION OF APPROPRIATE TECHNOLOGY

Total time: 2 hours

Objective: To determine criteria for appropriate technologies in developing countries

Resources:

- * deMoll, Lane and Coe, Stepping Stones: Appropriate Technology and Beyond

  Selections from the above publication:

  Bender, "Changing Possibilities," pp. 9-10

  Bender, "New Values," pp. 47-51

- * Reddy, Technology, Development and the Environment: A Re-Appraisal, "Criteria for the Selection of Technology," pp. 217

Trainer Notes

Sufficient copies of the resource materials should be prepared for distribution during this session.

Materials: Newsprint and felt-tip pens

Procedures:

Step 1. (5 minutes)
Provide a brief introduction by reviewing the session objectives.

Step 2. (10 minutes)
Have participants write down their own individual definitions of "appropriate technology."

Step 3. (20 minutes)
Have participants form groups of up to 5 people and develop a list of the major criteria for appropriate technology in the United States.

Step 4. (45 minutes)
Distribute copies of "Changing Possibilities" and "New Values" and have the groups:
- * Read these articles.
- * Discuss how the definition of appropriate technology may differ in developing countries.
- * Revise their criteria lists accordingly.

Step 5. (30 minutes)
Reconvene the groups and have a representative from each one present and discuss their lists.

Trainer Notes

Stimulate discussion regarding the lists by calling attention to the following questions:

* Are the criteria for "appropriate technologies" in the United States significantly different from those in the developing world? If so, why? If not, why not?

* What are some potential political implications of development of "appropriate technologies" in the United States and in the Third World?

Step 6. (10 minutes)
Conclude the session by distributing the "Criteria for the Selection of Technology" and explaining that its purpose is to provide a final perspective on possible criteria for "appropriate technology."

Trainer Notes

Explain that they should keep these lists for use as reference in designing their various appropriate technology devices throughout the program.

STOVE PROMOTION AND DISSEMINATION

Total time: 2 hours

Objectives:

- To identify and discuss the advantages and disadvantages of various development approaches
- To discuss various approaches to stove promotion, dissemination and information-gathering

Resources:

- Aprovecho Institute, Helping People in Poor Countries, pp. 35-77
- Attachment III-14, "Stove Introduction and Dissemination: Case Studies 1 and 2"

Materials: Newsprint and felt-tip pens, chalkboard/chalk

Procedures:

Step 1. (5 minutes)
State the session objectives and outline the activities.

Step 2. (10 minutes)
Distribute Attachment III-14 and have the participants read it.

Step 3. (1 hour)
Have the participants identify and discuss the advantages and limitations of the development approaches described in each case study.

Trainer Notes

- On newsprint, record the advantages and disadvantages of each development approach as it is raised.
- Encourage any conclusions or observations from the participants.
- Point out that there is no clear, correct approach. There are advantages and disadvantages to all approaches.
- Stress the following guidelines:
  Learn about the community.
  Discover existing needs, resources, ideas and methods of problem-solving.
  Use a participatory, dialogue approach in working with a community or other groups.

Step 5. (40 minutes)
Discuss various approaches to information-gathering, stove promotion and dissemination.

Trainer Notes

Encourage discussion by asking:

* Assuming a need for cookstoves (or stove improvement) exists, how would you help a program get started?

* Then, how would you get people interested in cookstoves?

Some responses that may be generated are:

* Assess the needs and receptiveness of villagers.

* Establish rapport and trust in the community.

* Assess local resources, i.e., materials, skills (potters, mason).

* Examine other development programs in the community, analyzing the community's receptivity to change, amount of free time, etc.

Additional questions that could be raised during the discussion are:

* How would you promote the development of a national stove program?

* What would be a good location for a stove demonstration center. What would it do? What would be the drawbacks of a regional or local center?

Step 6. (5 minutes)
Have a participant summarize the key points of the discussion.

Trainer Notes

Refer the participants to Helping People in Poor Countries, Chapters III and IV, for additional information, background and ideas.

STOVE INTRODUCTION AND DISSEMINATION: CASE STUDY 1

A volunteer health worker in a small town in the Sahel noticed many women suffering from the smoke in their kitchens. Remembering the wood stoves she had seen as a child in Europe, she developed a simple box-shaped stove with two potholes and a chimney. She had a local mason build the first stoves to her specifications, using adobe and mud mortar as material and making the cooking surface low, to suit local cooking habits.

She convinced some women friends in the town to try out the new stoves and they liked them. Not only did the stoves eliminate the smoke, they also saved firewood, allowed for more stable cooking and provided a raised surface to prepare food and place condiments. Soon the word spread: the stoves became popular in town and in the surrounding villages. The mason could hardly keep up with the orders for "a stove from Mademoiselle." The volunteer began to charge a fee to cover materials and construction costs. This became especially important after she and the mason decided to substitute fired bricks, mortar and concrete for the adobe, in order to make stronger and more durable stoves.

When the volunteer's term was up, one of the foreign aid agencies offered to expand her work into a nationwide stove promotion and dissemination program. She moved to the capital, where a stove demonstration center was built. Publicity campaigns were started in the newspaper and on radio. A local artist designed a stove T-shirt. Three or four standard models were on display at the stove center and could be ordered from a young woman hired to run the stoves for demonstration. A team of masons then came to the customer's home and built the model she had chosen in her kitchen, with instructions of how to properly cure the concrete stove top. Customers were mainly the wives of merchants and government officials. The stoves were becoming a sought-after status symbol in the capital city.

Plans for dissemination included creating more stove centers in other major towns throughout the country. Each would have its own mason team, trained in the capital, to build stoves locally. Radio promotion and word-of-mouth were counted on to create a demand for stoves.

Unfortunately, many of the stoves cracked badly in spite of the improved materials. Users were often impatient and did not let their concrete stoves cure long enough. If a stove broke down, it was sufficient to call the stove demonstration center, and a mason would be sent to repair the stove.

To date, the program is a success. There is a three-week waiting list to have a stove built, and orders are still coming in.

STOVE INTRODUCTION AND DISSEMINATION: CASE STUDY 2

In one Sahelian country, stove developers and local people designed a cookstove together. Local awareness of the firewood crisis was high, due to a Peace Corps energy survey which had recently been taken in the village. The villagers talked to the stove developers of their methods for conserving wood: windbreaks, lids on pots, putting out embers with sand, etc. Then they all talked of reducing heat loss during cooking, using the analogy of light lost from a lantern. Together they decided that putting walls around the fire would be a great improvement. There remained a question of materials: what should this wall be made out of? At this point, the stove developers showed the villagers some dried Lorena, and it was decided that this material might be suitable. Together with the local people, a stove was designed: the cooking pot would be surrounded by Lorena walls, and there would be an entrance on one side for feeding wood into the fire. A space all around the pot would allow the smoke to escape.

The result was a very simple chimneyless one-hole stove. This stove came to play a key role in the national stove dissemination program, especially for regions where one-pot cooking is common. The stated aim of the national program is to saturate the country with stoves by training as many different groups and individuals as possible in stove construction. Workshops are being held all over the country, either by an itinerant mason team or by volunteers stationed in out-lying areas. Local social service organizations are also involved in the training effort. It is hoped that trainees will either become trainers of others, or stove masons who will construct stoves for pay.

Here is an example of how this dissemination effort has worked: a Peace Corps Volunteer taught several women in his village how to build stoves. When he returned after a fortnight away from his village, he found that over a hundred stoves had been built in his absence. Half of them had been built by the women he had trained; the other half by women whom his trainees had taught. The stoves look like volcanoes, rather than model stoves, but they save wood and direct smoke away from the eyes towards the ceiling of the hut. Even though many of the firebox bridges crack and some cave in (partly due to construction flaws and partly due to wear-and-tear), cooks continue to use them and are enthusiastic about their stoves.

EXPLAINING COMPLETED COOKSTOVES

Total time: 1 hour

Objectives:

- To present and explain completed cookstoves
- To discuss the design and construction process for each stove
- To assess the stove training to date

Materials: Completed cookstoves, discussion questions

Trainer Notes

This session requires some preparation. Clearly print the discussion questions on newsprint (see Trainer Notes, Step 2).

Procedures: Step 1. (5 minutes)
Review the session objectives and outline the activities.

Trainer Notes

Explain that in this session, participants will form their original stove construction groups to present and explain the completed stoves to the other groups and discuss the construction and design process.

Step 2. (5 minutes)
Post and explain the discussion questions.

Trainer Notes

Discussion questions include:

- What were the design criteria for the stove?
- What successes and difficulties were encountered during construction?
- Did the work group develop any tools or techniques?
- If so, were they applied successfully?
- What were the dynamics within the work group?
- Was there cooperation and were skills shared?

Explain that each group should respond to the above questions when explaining their stoves.

Step 3. (40 minutes)
Have each group present their stove and discuss how it was designed and constructed.

Trainer Notes

Divide the time allotted for this step evenly among the groups.

Step 4. (10 minutes)
Reconvene the group and have them briefly assess the stove training to date, making suggestions for improvement.

Trainer Notes

Consider the suggestions given by the group in planning and preparing for the remaining sessions, especially before building the second stove.

EVALUATING COOKSTOVE EFFICIENCY

Total time: 2 hours

Objectives:

* To design a methodology for testing wood consumption in a cookstove
* To evaluate wood consumption in a cookstove
* To identify and discuss rules and variables that influence the evaluation procedure
* To discuss the major points of a survey

Resources:

* Evans and Boutette, Lorena Stoves, pp. 84-106
* Aprovecho Institute, Guidelines for Evaluating the Fuel Consumption of Improved Cookstoves
* Aprovecho Institute, Helping People in Poor Countries, pp. 86-95
* Dutt, Field Evaluation of Wood Stoves
* Friesan, "Papers on Cooking Simulation Tests"

Materials: Cookstoves, fuel, pots, water, thermometers, newsprint and felt-tip pens

Procedures: Step 1. (5 minutes)
Review the session objectives and outline the activities.

Trainer Notes

Mention the following points during the introduction:

* As PCVs, you may find yourselves in a region in which stoves have already been introduced.
* Your job may involve more follow-up and evaluation of different designs than the promotion of stoves.
* Design modifications of existing stoves can be identified through testing and evaluation.

Step 2. (5 minutes)
Explain the procedures to be followed in evaluating and testing the amount of wood used by cookstoves.

Trainer Notes

Have the participants form small groups to design and use a method for testing and evaluating the amount of wood necessary to boil water on their cookstoves.

Ask each group to record general rules and specific variables during their tests.

Mention that they will have 50 minutes to design and carry out their evaluations.

Refer them to Lorena Stoves, pages 88-89, for background information.

Step 3. (50 minutes)
Have the participants form small groups and design and carry out their tests and evaluations.

Step 4. (25 minutes)
Reconvene the groups and discuss the general rules and specific variables that they recorded.

Trainer Notes

Have participants name and discuss the rules and variables that they noted. Record these responses on newsprint in two columns, one entitled, "Rules," and the other, "Variables." The following lists include some of the responses that should be discussed:

Rules

- Define objective
- Establish realistic, representative cooking conditions
- Change only one variable during tests
- Repeat each test using the same stove operator

Variables

- Temperature and quantity of water
- Weather conditions
- Altitude
- Wood (type, moisture content, size, rate of burning)
- Stove operator
- Type and size of cooking vessels (clay, aluminum, iron, with/without lids)

For a more complete list of variables, see Helping People in Poor Countries, page 92.

Stress that the stove operator is often the most significant variable.

Mention the difficulties of gathering reliable data for testing fuel consumption in cookstoves.

Continued

Trainer Notes/Continued

Ask the group about data interpretation:

> How do you use data to optimize design of cookstoves within the limits of local cooking customs?

The ideal would be to use the results of the consumption tests to design a stove that will bring water to a boil quickly in one pot and allow a second pot to simmer.

Step 5. (20 minutes)
Have participants identify and discuss criteria, other than wood consumption, that could be used to evaluate a stove.

Trainer Notes

List the participants' responses on newsprint. If necessary, stimulate the discussion by suggesting such criteria as: health, hygiene, convenience, suitability to local cooking needs, etc.

Explain that the most widely accepted method for testing and evaluating these other criteria is through the use of a "survey."

Step 6. (10 minutes)
Have the participants identify and discuss the major points of an effective survey.

Trainer Notes

Major points of a survey include:

* An unbiased sample
* A large sample
* An accurate recording of observations

Refer participants to Dutt, Field Evaluation of Cookstoves, for further information.

Step 7. (5 minutes)
Conclude the session by having a participant summarize the major points that were discussed.

Trainer Notes

Ask him/her to comment on the kinds of information one could expect to obtain through surveys, cooking simulation tests and actual field measurements.

DIAGNOSING AND REPAIRING MALFUNCTIONING COOKSTOVES
PART ONE: DIAGNOSIS

Total time: 1 hour

Objectives:
- To diagnose problems with malfunctioning stoves
- To discuss cultural values which influence diagnosis and repair of malfunctioning stoves

Resources:
- Attachment II-17/1, "Cookstove Role-Play Situations"
- Evans and Boutette, Lorena Stoves, pp. 74-75

Materials: Malfunctioning cookstoves, fuel, pots for cooking

Trainer Notes

This session requires preparation. You will need several malfunctioning stoves. If necessary, sabotage the stoves so that each has a different problem, i.e., a fallen firebox bridge, cracks, poor draft, poorly fitting potholes, a clogged chimney or tunnel, etc.

Before the session begins, select three volunteers from among the participants to take part in the role-play. The role-players should consist of a woman villager and a visiting man-woman team of development workers involved in a cookstove program.

Brief the "Village Woman" apart from the "Development Workers" to promote more spontaneous and genuine responses from the role-players. Distribute Part A of the Attachment II-17/1 to the "Village Woman" and Part B to the "Development Workers." The role-players should be prepared before the session begins.

Procedures: Step 1. (5 minutes)
Review the session objectives and explain the activities.

Trainer Notes

Explain that this is a two-part session: Part One will deal with diagnosing problems with cookstoves, and Part Two will deal with repairing them.

When you mention the role-play activity, ask that participants watch for behaviors among the role-players that reflect cultural values.

Step 2. (15 minutes)
Have the volunteers perform the role-play.

Step 3. (15 minutes)
Have participants discuss the role-play.

Trainer Notes

To stimulate discussion, ask the following questions:

- How did the role-players feel during their performances?
- What did you notice during the role-play that might have reflected the development workers' cultural values? The villagers cultural values?
- What issues were brought out regarding diagnosis and repair of malfunctioning stoves?

Step 4. (20 minutes)
Guide the participants to each of the malfunctioning stoves and have them diagnose the problem with each.

Trainer Notes

- Have the participants suggest ways to repair each stove.
- It may be necessary to start fires in some of the stoves to diagnose the problems.

COOKSTOVE ROLE-PLAY SITUATIONS

Part A: The Village Woman

You are the woman-of-the-house in a small rural village. About six months ago, a team of development workers from the Ministry of Community Development convinced you that you needed an improved cookstove. They built the stove and briefly showed you how to use it.

You used the stove successfully for a few weeks when it ceased to function properly. You were unable to find out why, so you returned to cooking on an open fire.

You had heard from a village official that a new development team was in the area, and that they might be able to repair the stove. You have invited them to stop by your house.

When they arrive, you will be cooking on an open fire next to your non-functioning sand/clay cookstove. To make the role-play more realistic, you are encouraged to improvise a costume and, if possible, be preparing a hot beverage for your visitors.

------------------- Cut here for distribution -------------------

Part B: The Development Team

You are a female health worker and a male technical stove worker assigned to the Ministry of Community Development. You have recently arrived in-country and have just begun your field assignment. This is your first visit to a village and you are very eager to make a favorable impression.

You have been asked by one of the village officials to visit the house of one of the village women to examine her improved cookstove that is not functioning properly. You have been told by the official that the stove was built about six months ago by another team of development workers.

DIAGNOSING AND REPAIRING MALFUNCTIONING COOKSTOVES
PART TWO: REPAIR

Total time:	1 hour
Objective:	To repair malfunctioning cookstoves and/or improve existing ones
Resources:	Evans and Boutette, Lorena Stoves, pp. 74-75
Materials:	Damaged or poorly constructed stoves, sand/clay mix, water, spoons, machetes

Procedures: Step 1. (55 minutes)
Have the participants form work groups and repair or improve a malfunctioning or poorly constructed stove.

Trainer Notes

* Assign each work group one of the malfunctioning stoves.

* Circulate among the groups and assist them by pointing out specific problems and methods for repairing them.

* Mention the importance of improving stoves through better baffles, different kinds of dampers, better firebox sizes and shapes, etc.

Step 2. (5 minutes)
Reconvene the groups and have them read pages 74 and 75 of Lorena Stoves before the end of the session.

OTHER RESPONSES TO FUEL SCARCITY

Total time: 1 hour

Objectives:

* To identify and discuss possible responses to fuel scarcity in the developing world (other than fuel-saving cookstoves)

* To discuss and examine a retained heat (haybox) cooker

Resources:

* Aprovecho Institute, Helping People in Poor Countries, pp. 98-100

* Aprovecho Institute, Retained Heat Cooking

Materials: Two retained heat (haybox) cookers, basket or box with lids, hay or other insulation material, cookpot with lid, soup, rice, beans or stew, newsprint and felt-tip pens

Trainer Notes

In this session, the retained heat or haybox cooker will be demonstrated. You will need to prepare a pot of food to be cooked in the haybox. (For more information, see Helping People in Poor Countries, pages 98 - 100.)

Procedures:

Step 1. (5 minutes)
Review the session objectives and outline the activities.

Step 2. (10 minutes)
Have the participants identify and discuss possible responses to fuel scarcity in the developing world (other than fuel-saving cookstoves).

Trainer Notes

* List the responses on newsprint.

* Some possible responses include: reforestation, solar energy, biogas, retained heat cookers, kerosene, charcoal, etc. (See Phase I: Session 14, "Global Energy Issues," for more information.)

* Explain that this session will focus on one of these responses: the retained heat or haybox cooker.

Step 3. (40 minutes)
Demonstrate and discuss how the retained heat (haybox) cooker works.

Trainer Notes

Begin by bringing a pot of beans or soup to a boil. With the lid on, put the pot into the haybox. Do not open it until the food is cooked (about one hour and 15 minutes for rice or three hours for beans).

Encourage the participants to examine and ask questions about the cooker.

Stimulate discussion by asking the following questions:

- How does the retained heat cooker work?
- What heat retention principles does it employ?
- What are the fuel-saving advantages of the cooker?

Points to cover when explaining the haybox cooker include:

- Stop the air flow (convection) with a lid on the pot and with a tightly enclosed box, bag or basket.
- Stop conduction and radiation with insulation (straw, sawdust, feathers, etc.) packed tightly around the pot. Approximately four inches of most insulating materials will be sufficient. Stress the use of locally available insulating materials.
- The haybox does not work for small amounts of food. There must be sufficient mass of food for it to store enough heat to work properly.
- The haybox does not work well at high altitudes. The initial temperature of boiling water at high altitudes is not enough to store adequate heat.
- The foods for which the haybox is most suitable include those needing long, slow cooking periods (such as beans, grains, root vegetables, tough meats, stews, soups, long-cooking sauces, etc.).

Step 4. (5 minutes)
Have a participant summarize the advantages of a retained heat (haybox) cooker.

Trainer Notes

Mention that a cooker can be an effective first step, alternative or complement to introducing cookstoves to a village and that it can serve to establish the credibility of a development worker.

CHARCOAL PRODUCTION AND STOVES

Total time: 1 hour

Objectives:

- To discuss how charcoal is produced
- To identify and discuss advantages and disadvantages of charcoal as a fuel
- To discuss ways in which traditional charcoal cookstoves could be improved

Resource: Aprovecho Institute, Helping People in Poor Countries, pp. 132-137

Materials: Wood for fuel, retort (see Trainer Note, Step 4), examples of traditional charcoal cookstoves, newsprint and felt-tip pens or chalkboard/chalk

Trainer Notes

This session will require preparation of a charcoal retort. You will also need to have an operating charcoal stove for demonstration purposes (see Trainer Notes, Step 2).

Procedures:

Step 1. (5 minutes)
Review the session objectives and outline the activities.

Step 2. (10 minutes)
Have the participants identify and discuss the characteristics of a charcoal fire, as compared with a wood fire.

Trainer Notes

Ask the participants if they have ever cooked on a charcoal fire and if they noticed how it burned differently from a wood fire. List their responses on newsprint, and encourage questions and discussions.

If they are not identified by the group, add the following characteristics to the list:

- Little flame
- More even heat
- Mostly radiant heat (pots need to be closer)
- Few hot gases (not suitable for stoves with tunnels)
- Needs more evenly distributed air (burns best on 25% - 35% grate)

For demonstration purposes, it is best to have a functioning charcoal stove on hand during the discussion.

Step 3. (10 minutes)
Briefly explain how charcoal is produced.

Trainer Notes

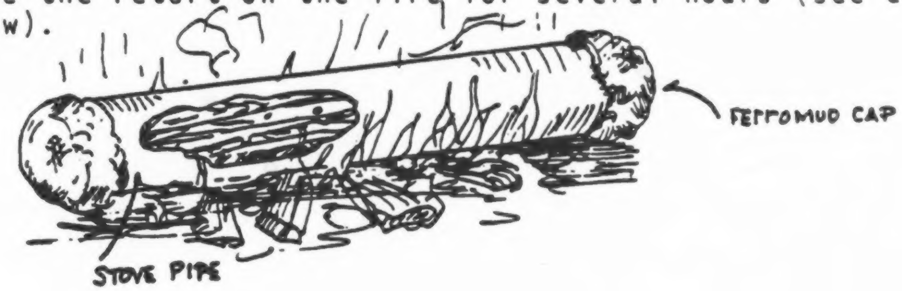
Describe the earthen mound system, external fire charcoal retorts and internal fire charcoal kilns. Discuss efficiencies of each type (wood in - charcoal out) and the energy content of charcoal and wood.

Step 4. (Optional, 10 minutes)
Have the group begin the charcoal-making process by loading and firing a retort.

Trainer Notes

To make a simple retort:

* Using a 60cm (2') section of stove pipe, load it tightly with wood, being careful to allow some air space.
* Cap the ends of the stove with ferromud (fine mesh wire plastered with a clay/sand mixture).
* Set the retort over an open fire.
* Periodically check the ends for air leaks.
* Leave the retort on the fire for several hours (see drawing below).



Step 5. (15 minutes)
Have the participants identify and discuss the advantages and disadvantages of charcoal as a fuel.

Trainer Notes

List the advantages and disadvantages in separate columns on newsprint. Add the following points to the list, if they are not identified by the participants:

Continued

Trainer Notes/Continued

Advantages	Disadvantages
* Low smoke * Light weight for transport * Less volume (easy to store, especially in cities) * Used with low cost and portable stoves * Easy to see * Stores well for a long period at a constant moisture content * Provides employment	* Increased deforestation due to poor conversion rate (out of total wood burned for charcoal, there is a 65 - 80% energy loss) * Gives off poisonous fumes * Dirty * Carbon dust is health hazard

Explain that although charcoal causes more rapid deforestation, the demand for charcoal will continue. There will continue to be a demand for it as a fuel source in the cities. The need exists to develop more efficient charcoal production techniques and charcoal stoves.

Step 6. (15 minutes)
Present examples of traditional charcoal cookstoves and discuss ways in which they could be made more fuel-efficient.

Trainer Notes

Suggest the following improvements:

* Insulate around the stove and under the grate area (leaving sufficient draft).
* Install a damper.
* Construct a ferromud chimney around the pot.
* Recess the pot deeper into the stove.

Step 7. (5 minutes)
Conclude by reviewing the objectives.

Trainer Notes

Explain that everyone will have the option of building a charcoal cookstove in the second stove construction session, Phase II: Session 21.

Encourage participants going to urban areas or countries in which charcoal is common to build charcoal stoves in Session 21.

CUSTOM AND FOOD

Total time: 2 hours

Objectives:

- To discuss the role that custom and belief play in determining diets in the United States and in developing countries
- To develop a sample, low-cost, nutritious diet using specific cultural guidelines

Resources:

- Werner, Where There Is No Doctor, pp. 1-17
- Brownlee, Community, Culture & Care, pp. 173-213
- Jelliffe, Child Nutrition in Developing Countries, Chapter IV
- Katz, Food, Where Nutrition, Politics and Culture Meet, pp. 8-10
- Attachment II-20, "Planning a Low-Budget, Nutritious and Culturally Appropriate Diet"

Materials: Newsprint and felt-tip pens, notebooks, pencils or pens

Trainer Notes

Prepare copies of the Jelliffe and Katz resources for distribution during the session.

Procedures:

Step 1. (5 minutes)
Review the session objectives and activities.

Step 2. (55 minutes)
Distribute copies of the Jelliffe and Katz resource materials and have the participants read them.

Step 3. (15 minutes)
Have the participants identify the main points covered in the readings and briefly discuss them.

Step 4. (10 minutes)
Have the participants list (in their notebooks) and categorize ten of their favorite childhood foods and ten of their currently favorite foods.

Trainer Notes

Have participants associate each food with the categories described in the Jelliffe material (pages 62-64), i.e., cultural super, prestige, body image, physiological, sympathetic magic group.

Ask why such foods have been or are favorites and encourage comments and questions.

Explain that participants should keep their food lists in their notebooks for use in Phase II: Session 23.

Step 5. (10 minutes)
Have the participants list and categorize ten foods that are "typical" in the countries in which they will be serving as Peace Corps Volunteers.

Trainer Notes

Use the same categories from the Jelliffe book and ask the participants to save the lists for use in Phase II: Session 23.

Step 6. (10 minutes)
Distribute, review and explain Attachment II-20, "Planning a Low-Budget, Nutritious and Culturally Appropriate Diet."

Trainer Notes

Attachment II-20 contains an on-going assignment that is to be worked on throughout the program and completed in Phase V.

Explain that:

* The participants have the option of forming small groups to work cooperatively on the assignment.

* The completion of the assignment will require additional information that will be covered in Phase II: Session 23, "Basic Nutrition."

* The assignment will be due and discussed during Phase V: Session 14, "Planning a Nutritional Garden."

Step 7. (15 minutes)
Have the participants begin working on their assignments.

PLANNING A LOW-BUDGET, NUTRITIOUS AND CULTURALLY APPROPRIATE DIET

The following foods and their prices are typical of the diet in the Ecuadorian highland region. Plan a day's menu that provides sufficient protein, fats, vitamins, minerals and caloric requirements, and falls within the guidelines of available time for preparation and economic and cultural constraints.

* There are six people in the family, including four children (ages 1 to 12).
* Corn products are usually available and need not be purchased.
* There is a scarcity of quinoa, a high-protein grain, and it is available only in limited quantities.
* Fava beans must be purchased, since the crop has failed this year.
* You have the equivalent of one dollar to spend for the day's meals.
* Milk and cheese are available only in the city (an hour's walk away, or a 12-cent bus ride) and meat is sometimes available only in the city.
* Wild greens are in limited supply, since the rains have not been constant.
* There is squash available in the fields, but only in limited quantity.
* The woman in the family suffers from "white discharge" and will not eat milk products, squash or pork because it may make her condition worse.
* Two of the under-five children have diarrhea and will not be allowed to eat "cold" foods: squash, pork, oranges, papaya.
* Guinea pig (cuy) is used for festive occasions (as is any other meat product, except for fat/lard).
* The family has an income of approximately $60 (U.S.) a month, of which $20 must be spent on the children's education: bus, books, uniforms, fees, etc.
* The rains have not come and grasses (at about 4 cents a bunch) must be purchased for the guinea pigs each day since there is no other food.
* There are a few vegetables in the family garden, left over from a previous Peace Corps project, but they are withering rapidly from the lack of water and care.

- Firewood must be brought down from the mountain (where the hacienda owner has his land), a job requiring two days. In addition, the family must pay with labor for the wood carried out.
- The husband must be taken his lunch. He works at a construction site temporarily, in a city nearby which is accessible by walking or by bus.
- Water comes from the community tap, but the nearest one is not working, so a trip must be made down into the village.
- There is a fiesta to be held this weekend at the house of relatives. The family is expected to bring food and drink, so money must be put aside to buy extra potatoes, lard, beans and a bottle of trago.
- The woman's breast milk is drying up, and the one-year-old is losing weight.
- One of the children is expelling worms when he defecates. The mother restricts his intake of milk and other "cold" foods until the worms are gone.
- Money must be kept aside for cooperative dues (20 cents per month).
- The bean water (from cooking beans) cannot be used, due to the woman's illness (the white discharge).
- The family is afraid of extremely "cold" foods, especially in the early morning or at night. Such foods are: cabbage, pork, squash, oranges, and any leftovers that have not been boiled.
- The biggest meal is at mid-day and must include beans, corn, soup (with a corn or oatmeal base or a broth with potatoes and suet), and potatoes.
- There are two other meals: early morning, where herb tea and sugar are drunk with a piece of bread or toasted corn or leftover soup; and the evening meal, where soup or leftovers from lunch are served.

Foods and Prices

Beans: 20 to 40 cents per lb. (Some may be available from crops.)
Lentils: 30 cents per lb.
Fava beans: about 40 cents per lb.
Quinoa: 30 cents per lb.
Cuy: 4 dollars per animal
Meat:one dollar per lb.
Suet (fat from meat): 50 cents per 1/2 lb.
Lard: 75 cents per 1/2 lb.
Vegetable shortening: 75 cents per lb.
Oil: 1.20 per liter
Bananas: 2 cents each
Oranges: 2 cents each
Onions (scallion-type): 12 cents for 5-6 onions
Rice: 30 cents per lb.
Lettuce: 20 cents per head
Cabbage: 30 cents per head
Watercress, other greens: 4 cents per bunch
Tomatoes: 7 cents each
Chili peppers: 4 cents for 5-6 peppers
Chicken: one dollar per lb. (only in 3-4 lb. quantities)
Potatoes: 12 cents per lb.
Milk: 25 cents per liter
Cheese: one dollar per lb.
Raw sugar: 10 cents per block (2 cups, more or less)
White sugar: 25 cents per lb.
Herbs: 1-4 cents per bunch
Papaya: 30 cents each
Canned tuna: one dollar per can
Noodles: 50 cents per lb.
Bread: 2 cents per loaf
Eggs: 10 cents each
Butter: one dollar per lb.
Spices: 4 cents per oz.
Soft drinks: 15 cents
Liquor (*trago*): one dollar per bottle

* * *

After completing the exercise, take time to discuss, in writing, the following:

1. Name several economic constraints that limited the amounts or types of foods purchased.
2. Name several social/cultural considerations you followed in planning the diet.
3. What was the most difficult aspect of the planning (i.e., the economics, cultural factors, availability or scarcity of foods, etc.)?
4. Which major nutrients are included (in proper amounts) in the diet? Which are lacking?
5. Do you think that a rural family can eat nutritious meals based on the information included in this exercise? Explain.
6. What would you add or delete from the exercise?

DESIGN AND CONSTRUCTION OF THE SECOND STOVE
PART ONE: STOVE BASE

Total time: 1 hour

Objectives:

- To design and construct a second, improved cookstove
- To lay out and build the base for the second, improved cookstove

Resources:

- Aprovecho Institute, Helping People in Poor Countries, pp. 111-144
- Evans and Boutette, Lorena Stoves

Materials: Clay, sand, rubble, water, earthen blocks, bricks, soil cement blocks, rocks, mortar, sifters, shovels, hoes, machetes, trowels

Trainer Notes

The format for building stoves a second time may vary, according to the training program. Depending upon the needs of the participants and the time available in the program, the following options can be exercised:

- The second stove may be completely built anew, beginning with the base construction, including new clay and sand for mixing.
- After removing the clay/sand mass, the second stove may be built from the original base or floor, using the same mix or mixing anew, emphasizing speed, finish and care.
- A second stove may be designed but not built.

At least one of the original stoves should be left for use during the Health and Nutrition sessions.

Procedures:

Step 1. (5 minutes)
Explain the session objectives and review the activities.

Step 2. (5 minutes)
Discuss and clarify the second stove construction options.

Trainer Notes

Explain that constructing a second, improved cookstove is an opportunity for independent work and the application of stove principles learned to date.

Explain that the participants may select a stove design appropriate to the country in which they will be serving.

Suggest the following improved charcoal stove designs for those participants who will be going to urban areas or countries in which charcoal use is common:

* The Voltena stove
* The Singer stove
* Sand/clay (Lorena) charcoal stove
* Portable metal charcoal stoves (the improved Tiki, for example)

Participants may also choose to work on improving the designs of existing charcoal stoves. Additional designs (and details on the stoves listed above) can be found in Helping People in Poor Countries, pages 111-144.

Mention that since sheetmetal stove pipes may be expensive or unavailable, stove pipes should be built from alternative materials such as Lorena blocks, ferromud, bamboo, clay tiles, etc. (Refer the participants to pages 66-68 in Lorena Stoves for more information.)

Explain that the work groups building cookstoves with chimneys will be asked to give a presentation on chimneys during the stove tours (see Phase II: Session 22) and should pay special attention to the previously-cited reference.

Step 3. (50 minutes)
Have the participants form their work groups, design their stoves and lay out their stove bases.

Trainer Notes

The procedure here is the same as described in Phase II: Session 10, Part 1.

DESIGN AND CONSTRUCTION OF THE SECOND STOVE
PART TWO: STOVE MASS

Total time: 3 hours

Objectives:

- To design and construct a second, improved cookstove
- To build the mass for the second cookstove
- To use stove construction skills

Resources:

- Aprovecho Institute, Helping People in Poor Countries, pp. 111-144
- Evans and Boutette, Lorena Stoves, pp. 50-57 and 66-68

Materials: Clay, sand, water, sifter, machete, trowels, shovels, hoes

Procedures:

Step 1. (5 minutes)
Review the session objectives and outline the activities.

Step 2. (2 hours, 55 minutes)
Have the participants form construction groups and construct the stove masses.

Trainer Notes

- Details on the construction of the stove mass can be found in Phase II: Session 10, Part 2.
- Encourage the participants to experiment with alternative chimneys. (Refer them to Lorena Stoves, pages 66-68.)

DESIGN AND CONSTRUCTION OF THE SECOND STOVE
PART THREE: EXCAVATION AND FINISHING

Total time: 2 hours

Objectives:

- To design and construct a second, improved cookstove
- To excavate and finish the cookstove
- To construct an alternative chimney for the cookstove

Resources:

- Aprovecho Institute, Helping People in Poor Countries, pp. 111-144
- Evans and Boutette, Lorena Stoves, pp. 58-69

Materials: Clay, sand, water, machete, trowels, spoons, shovels, hoes, bamboo, sheetmetal, wood (for dampers, baffles), nails, hammers

Procedures: Step 1. (5 minutes)
Present the session objectives and outline the activities.

Step 2. (1 hour, 55 minutes)
Have the construction groups excavate and finish their second, improved cookstove.

Trainer Notes

The procedure for the excavation of the stove mass can be found in Phase II: Session 10, Part 3 and in Lorena Stoves, pages 58-69.

Assist the groups in:

* Excavating pot holes, tunnels and chimney holes
* Cutting dampers
* Finishing the stoves

Encourage the groups to apply a protective coating to the stoves (refer to Lorena Stoves, pages 58-69, for details).

Stress the importance of using alternative materials for construction of chimneys (See Part One).

ALTERNATIVE COOKSTOVES: PRESENTATIONS

Total time: 1 hour

Objectives:

- To discuss experiences gained during stove construction
- To compare and contrast the construction of the second group of cookstoves with the first
- To discuss alternatives to sheetmetal stove pipes
- To discuss chimney safety

Resources: Evans and Boutette, Lorena Stoves, pp. 66-68, 72, 108

Materials: Recently completed cookstoves, old stovepipe with creosote buildup

Trainer Notes

Before beginning this session, list the discussion questions on newsprint (or make copies for distribution). See Step 2.

Procedures: Step 1. (5 minutes)
Introduce the session objectives and activities.

Step 2. (45 minutes)
Have each group present and explain their newly completed cookstoves.

Trainer Notes

Have the groups present and discuss their stoves, answering the following questions:

- What criteria were used when designing the stove?
- What was learned during the construction of the cookstove?
- What would you do differently next time?
- If your stove has a chimney, what sort of chimney was built and why? Were alternative materials used?
- How did your second stove construction activity compare with the first?
- What different approaches to problem-solving were used?

Encourage questions and discussion from the group at the end of each presentation.

Step 3. (10 minutes)
Discuss chimney safety.

Trainer Notes

* Have a piece of old stovepipe with a heavy creosote buildup to circulate among the participants.

* Ask the participants to explain how and why creosote buildup occurs and why it is dangerous.

* Discuss briefly the maintenance, safety and insulation of chimney pipes.

* Examine the advantages of alternative stovepipe materials for insulation and minimizing creosote buildup.

* Refer the participants to Lorena Stoves, pages 67, 72 and 108 for further information.

BASIC NUTRITION

Total time: 2 hours

Objectives:

- To discuss and examine basic nutritional needs
- To discuss and analyze personal eating habits
- To discuss methods for nutrition education

Resources:

- Jelliffe, Child Nutrition in Developing Countries, Chapter 2
- King, Nutrition in Developing Countries
- Werner, Where There Is No Doctor, pp. 107-130
- Attachment II-23-A, "Signs of Nutritional Status"
- Attachment II-23-B, "The Food Square"
- Attachment II-23-C, "Plant Protein Complimentarity"
- Attachment II-23-D, "Daily Dietary Guidelines"
- Attachment II-23-E, "Four Day Food Diary"
- Attachment II-23-F, "Nutrition Education Tools"

Materials: Newsprint and felt-tip pens, "Favorite Food Lists" (developed by participants in Phase II: Session 20)

Trainer Notes

Copy Chapter 2, "The Human Diet," from Jelliffe's Child Nutrition in Developing Countries to distribute to participants as background reading material.

Procedures:

Step 1. (30 minutes)
Distribute the Jelliffe article, "The Human Diet," and Attachment II-23-A, "Signs of Nutritional Status," and allow time for people to read them.

Step 2. (10 minutes)
Distribute and review Attachments II-23-B, "The Food Square," and II-23-C, "Plant Protein Complimentarity."

Step 3. (15 minutes)
Have the participants form pairs. Using the lists developed in Session 20 of favorite foods, have them identify where the foods fit on the food square.

Step 4. (10 minutes)
Reconvene the participants and have them discuss their findings.

Trainer Notes

The following questions will help focus the discussion:

* What nutrients appear most in your favorite foods? Least?
* Are your food preferences beneficial, harmless or harmful to your health?
* Have your food preferences changed in nutritional value since childhood?

Step 5. (10 minutes)
Distribute and review Attachment II-23-D, "Daily Dietary Guidelines."

Trainer Notes

Point out that these guidelines offer one simple approach to determine the quality of daily diet.

Step 6. (20 minutes)
Have the group form pairs to conduct 24-hour dietary recalls on one another.

Trainer Notes

Explain the recall practice as a way to spot-check the adequacy of the daily diet. The food square and daily dietary guidelines should be consulted to evaluate the day's diet.

Step 7. (15 minutes)
Review the session objectives and distribute Attachment II-23-E, "Four Day Food Diary," as an assignment.

Trainer Notes

Explain that the assignment should be done over a four-day period and should serve to familiarize participants with how well daily diets meet established dietary guidelines. Answer any questions about the activity. Collect the diaries when they are completed and be available to offer help whenever necessary.

Step 8. (15 minutes)
Have the group discuss some ideas on nutrition education and distribute Attachment II-23-F for review.

Trainer Notes

The following questions will stimulate discussion:

* What do you think motivates people to improve their diets?

* Have you learned anything in this session that might lead you to improve your diet?

* Do you think some of the suggested concepts and tools can be applied successfully in your work as Peace Corps Volunteers?

* How do you plan to learn about local community foods and diets?

* Can you begin to think of ways appropriate technologies and nutrition can be used together?

Then, cite Jelliffe, King and Werner and Bower in the bibliography as resources for nutrition education.

SIGNS OF NUTRITIONAL STATUS

	GOOD	POOR
General appearance	Alert, responsive	Listless, apathetic
Hair	Shiny, lustrous, healthy scalp	Stringy, dull, brittle, dry, depigmented
Neck (gland)	No enlargement	Thyroid enlarged
Skin (face & neck)	Smooth, slightly moist, good color, reddish-pink mucous membrane	Greasy, discolored, scaly
Eyes	Bright, clear, no fatigue	Dryness, signs of infection, increased vascularity, glassiness, thickened conjunctiva
Lips	Good color, moist	Dry, scaly, swollen, angular lesions (stomatitis)
Tongue	Good pink color, surface papillae present, no lesions	Papillary atrophy, smooth appearance, swollen, red, beefy (glassitis)
Gums	Good pink color, no swelling or bleeding, firm	Marginal redness or swelling, receding, spongy
Teeth	Straight, no crowding, well-shaped jaw, clean, no discoloration	Unfilled caries, absent teeth, worn surfaces, mottled, malposition
Skin (general)	Smooth, slightly moist, good color	Rough, dry, scaly, pale, pigmented, irritated, petachia, bruises
Abdomen	Flat	Swollen
Legs, feet	No tenderness, weakness, or swelling, good color	Edema, tender calf, tingling, weakness
Skeleton	No malformations	Bowlegs, knock knees, chest deformity at diaphragm, beaded ribs, prominent scapulae

THE FOOD SQUARE

ENERGY FOODS

Staple Foods

Examples:
Cereals and grains
(Wheat, rice, maize, sorghum, millet, etc.)
Starchy roots
(Cassava, potatoes, etc.)
Starchy fruits
(Banana, breadfruit, etc.)

Importance

All staple foods are cheap energy sources. Cereals are also cheap sources of protein, iron and the vitamin B-complex.

BODY BUILDING FOODS

Protein Supplements

Examples:
Legumes
(Beans, peas, groundnuts*, soya-beans*, etc.)
Nuts*
(Almonds, walnuts, cashews, hazel nuts, etc.)
Oil seeds*
(Sesame, sunflower, etc.)
Animal products
(Milk, meat, fish, eggs, insects, etc.)

Importance

Combined with staples, these foods increase the quantity and improve the quality of the protein in the meal.

* Also valuable as an energy supplement, due to their high fat content.

PROTECTIVE FOODS

Vitamin and Mineral Supplements

Examples:
Vegetables
(Dark green leafy vegetables, kale, leek, carrots, turnips, tomatoes, peppers, etc.)
Fruits
(Mango, orange, papaya, etc.)

Importance

Provide vitamins A and C to the diet. Dark green leafy vegetables are also excellent sources of iron and the vitamin B complex.

ENERGY STORAGE FOODS

Energy Supplements

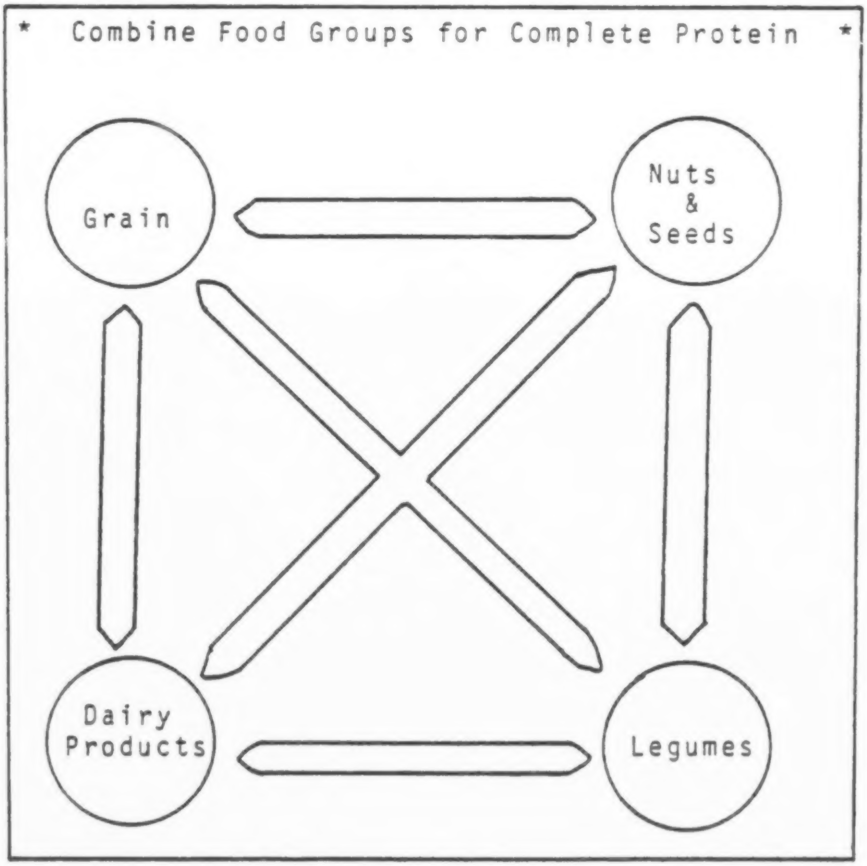
Examples:
Pure fats
(Oils, butter, ghee, lard, etc.)
Fat-rich foods
(Nuts, oil-seeds, bacon, fatty meat, etc.)
Pure carbohydrates
(Sugar, honey, jaggery, etc.)

Importance

These foods are low-bulk concentrated energy sources. Fat contains twice as much energy as carbohydrate.

Adapted from Lillemor Abrahamson and Nancy Velarde, "Food Classification for Developing Countries, page 117, Teaching Nutrition in Developing Countries, edited by Kathryn Shack, 1977, N. Y., Meals for Millions Foundation.

PLANT PROTEIN COMPLEMENTARITY


* Combine Food Groups for Complete Protein *
Grain
Nuts & Seeds
Dairy Products
Legumes

Adapted from page 124, Diet for a Small Planet, by Frances Moore Lappe, 1971, N. Y., Ballantine Books.

DAILY DIETARY GUIDELINES

Note: These guidelines are not designed for pregnant or lactating women or young people under the age of four years. Check current resources.

All Plant Diet

1-1/4	serving legumes or 1/3 serving legumes + 2 servings soymilk
3-5	servings whole grains (2 grains + slices bread)
1	serving nuts and/or seeds (sesame for calcium)
4	servings vegetables (2 dark leafy green)
1-4	servings fruits (1 raw citrus)
1-2	tablespoons nutritional yeast (B12 + B vitamins)
5-30	minutes skin exposure to sunlight for Vitamin D
1+	tablespoon polyunsaturated vegetable oil (linoleic acid)

Plant and Dairy Diet

1	serving legumes
4	servings whole grains
1	serving nuts and/or seeds
3	servings vegetables (1+ dark leafy green)
1-4	servings fruits (1 raw citrus)
2	servings dairy (3+ for the young)
5-30	minutes skin exposure to sunlight for Vitamin D
1+	tablespoon polyunsaturated vegetable oil (linoleic acid)

Animal Meat/Dairy and Plant Diet

2+	servings lean meat, poultry or fish
4	servings grains
4	servings vegetables & fruits (2 dark green/1 raw citrus)
2-4	servings dairy (eggs, up to 4 per week)
5-30	minutes skin exposure to sunlight for Vitamin D

Key

1 serving = 1 cup; 100 grams; 8 ounces liquid; 1/2 cup cooked cereal, rice or noodles; 1/2 cup raw or cooked vegetable; 1 slice bread; 1 potato or fruit; 4 T. peanut butter; 2 eggs; 2-3 ounces lean meat, fish or poultry; 2 ozs. of cheese; 4 ozs. of tofu.

Sources: Food and Nutrition Board, National Research Council (Revised 1974); Laurel's Kitchen, Robertson, Flinders & Godfrey, 1976, Berkeley, Nilgiri Press; Nutrition and Physical Fitness, Bogert, Boggs & Calloway, 1973, Philadelphia, Saunders.

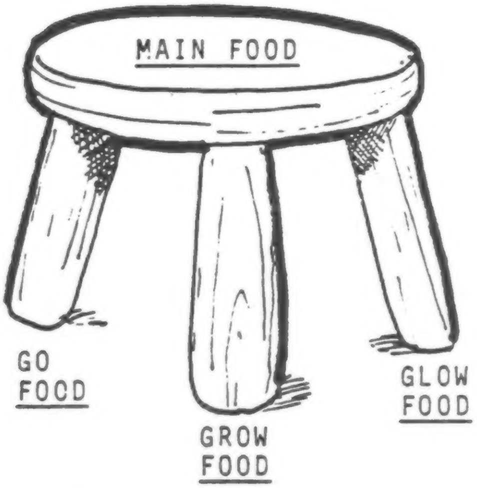
FOUR DAY FOOD DIARY

Keep a careful and accurate diary of the foods you eat over a four-day period. Organize the foods and their servings into categories (see below). Use the Food Square and the Daily Dietary Guidelines to organize your thinking about surveying your diet. Note the key on average servings for your entries.

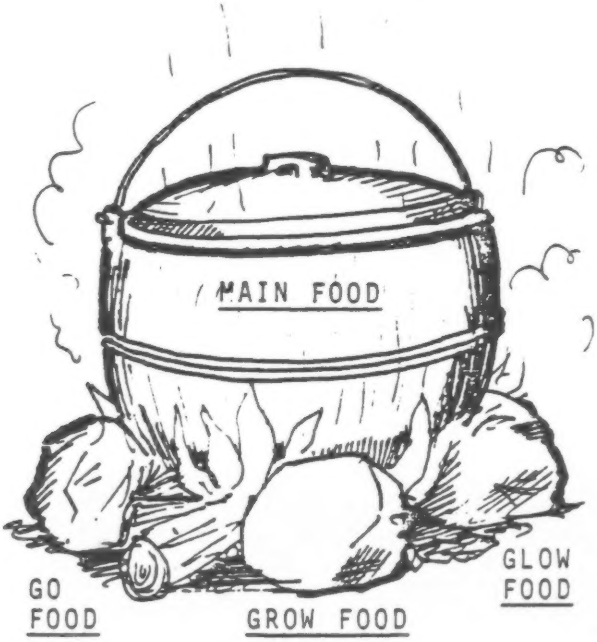
Record the number of servings you have daily in each category:

Food	Day 1	Day 2	Day 3	Day 4	4-Day Total	Average
Legumes Poultry Fish Meat						
Grains						
Dairy Products						
Vegetables (Color code: Dark, leafy greens and yellow/ orange)						
Fruits						
Nuts/Seeds						
Miscellaneous						

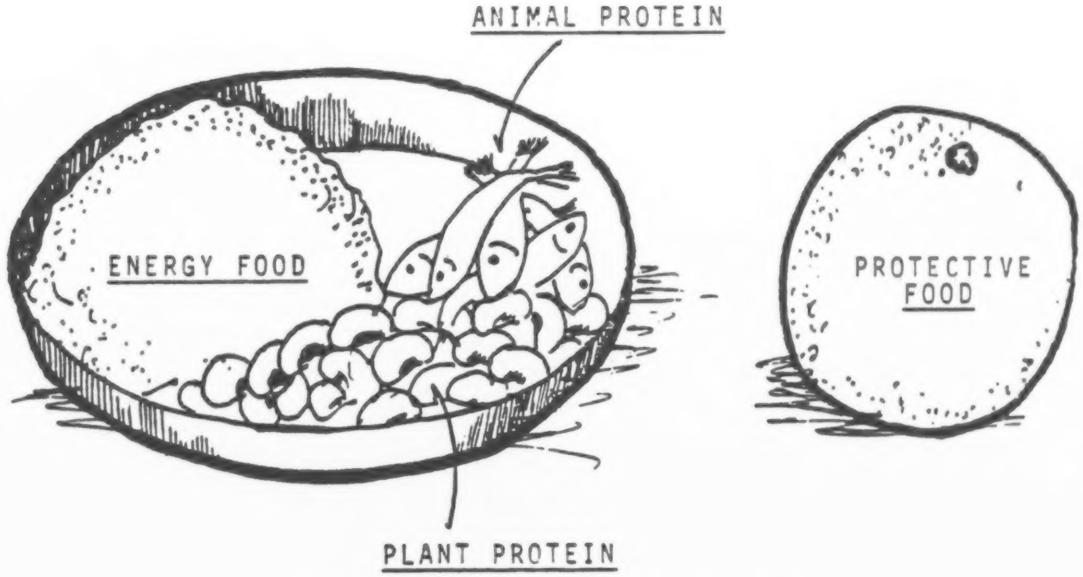
NUTRITION EDUCATION TOOLS


MAIN FOOD
GO FOOD
GROW FOOD
GLOW FOOD

THREE-LEGGED STOOL


MAIN FOOD
GO FOOD
GROW FOOD
GLOW FOOD

THREE ROCK FIRE


ANIMAL PROTEIN
ENERGY FOOD
PROTECTIVE FOOD
PLANT PROTEIN

A BALANCED MEAL IS A MIXED ONE.

Adapted from Werner and Bower, Helping Health Workers Learn, and King, Nutrition in Developing Countries.

COOKSTOVE OPERATION
PART ONE: COOKING ON SAND/CLAY COOKSTOVES

Total time: 4 hours

Objectives:

* To plan a nutritionally balanced and culturally appropriate meal
* To prepare the meal on a sand/clay cookstove
* To demonstrate the process to others

Resources:

* Jelliffe, Child Nutrition in Developing Countries, pp. 24-41
* Paley, Gardening for Better Nutrition, pp. 26-27
* Robertson, Flinders, Godfrey, Laurel's Kitchen
* Attachment II-24/1, "Evaluation of Cooking Exercise"

Materials: Sand/clay cookstoves (ready for firing), cook kits for each stove (pots, pans, cooking and eating utensils, pot holders), kindling, firewood, machetes, baking soda, water (in case of fire), foods as needed

Trainer Notes

This session will require considerable preparation. You will need to set up food stocks for the cooking activity and devise a food list with the cost of each food item (see Trainer Notes, Step 2). Read the session carefully before beginning.

Procedures:

Step 1. (5 minutes)
Present the session objectives and outline the activities.

Step 2. (15 minutes)
Give a brief talk on tropical foods. Invite comments.

Trainer Notes

Refer to Jelliffe, pages 24-41, for information.

Step 3. (15 minutes)
Give a brief talk on nutrition and cooking, inviting comments and discussion.

Trainer Notes

- Discuss information about the preservation of nutrients in cooking and the benefit of using cast-iron cookware.

- Refer to Laurel's Kitchen, pages 436 and 441-446, and to Paley, pages 26-27, for more information.

Step 4. (10 minutes)
Distribute and explain the food lists and costs to the participants.

Trainer Notes

Select foods that are specific to areas in which participants will be working as Peace Corps Volunteers.

Step 5. (30 minutes)
Have the participants form cooking groups and plan the meals they will be preparing.

Trainer Notes

Explain that this is a good opportunity for participants to practice planning culturally appropriate menus and cooking with foods that are common in the countries in which they will be serving.

To encourage low-cost menu planning, set a cost limit per person.

Have the groups plan their menu activity such that:

- All group members participate in all phases of planning, purchasing, preparing and demonstrating the meal.

- Appropriate technology devices are used and there is not a strong dependence on modern equipment.

- The meal is nutritionally balanced (See Phase II: Session 23, "Basic Nutrition," for more information).

Step 6. (20 minutes)
Have the groups purchase the foods they will need.

Trainer Notes

- Set up a role-play situation in which participants use their food item cost lists to "purchase" foods from staff members acting in the role of local market vendors.
- If a real local market is nearby, have the participants go there to purchase their foods.
- If there is an available garden, the participants should harvest their vegetable and herb needs, rather than purchase them.

Step 7. (1 hour, 20 minutes)
Have the participants prepare their meals using a sand/clay cookstove.

Step 8. (30 minutes)
When the meals are ready, have each group give a cooking demonstration, allowing the other groups to taste the food they have prepared.

Trainer Notes

Explain that each demonstration should:

- Describe how the stove works
- Describe the meal and its nutritional qualities
- Describe how the food was prepared and cooked to maintain nutritional value

Encourage each group to use non-technical language and non-formal education techniques in its demonstration.

Step 9. (20 minutes)
Distribute Attachment II-24/1, "Evaluation of Cooking Exercise," to each group and have them complete it.

Step 10. (15 minutes)
Have participants clean the work site.

EVALUATION OF COOKING EXERCISE

Answer the following questions in your cooking groups. Analyze the group process and the type of food prepared. The answers should be written as a group and given to the trainers.

1. How were the tasks divided? Who did what?
2. Did all group members participate fully? If not, why (what impeded cooperative effort)?
3. What food was cooked? What was the recipe?
4. What was the nutritional value of the food? What nutritional needs did the food satisfy? If there were sources of protein, were they complementary? (Illustrate.)
5. Did the food taste and look appetizing? If not, what could be done to improve flavor and appearance? Would you use this recipe again?
6. What appropriate technology devices were used in the preparation? Were they appropriate for the tasks? How could preparation have been more low-tech or appropriate or more efficient?
7. What would you tell others attempting to do the same job to make it flow more easily or better?
8. Were the devices used for food preparation potentially useful and suitable for application during Peace Corps service? Are they potentially appropriate for use by all members of a community, including women and children? Explain your answers.
9. Did you notice any implications for health during the use of the appropriate technology devices? Please state any observations.

COOKSTOVE OPERATION
PART TWO: EVALUATING COOKSTOVE OPERATION

Total time: 1 hour

Objectives:

- To identify and discuss advantages and disadvantages of cooking with an improved sand/clay cookstove
- To discuss ways to overcome the disadvantages
- To identify and discuss ways to conserve cookstove fuel

Resources:

- Evans and Boutette, Lorena Stoves, pp. 71-72, 74-75
- Jenquier, Appropriate Technology: Problems and Promises, Chapter II, "The Innovative System in Appropriate Technology, pp. 27-40

Materials: Newsprint and felt-tip pens

Procedures: Step 1. (5 minutes)
Review the session objectives and activities.

Step 2. (20 minutes)
Have the participants identify and discuss a list of advantages and disadvantages of cooking with improved sand/clay cookstoves.

Trainer Notes

Record their responses in two columns on posted newsprint.

Step 3. (15 minutes)
Discuss ways in which each of the disadvantages might be overcome.

Trainer Notes

For those disadvantages which relate to stove malfunctions, refer to pages 74-75 of Lorena Stoves.

Step 4. (15 minutes)
Have the participants identify and discuss ways of conserving the amount of fuel used in the cookstoves.

Trainer Notes

For detailed information regarding the points that should be covered in this discussion, see pages 71-72 in Lorena Stoves.

Step 5. (5 minutes)
Assign Chapter II, "The Innovative System in Appropriate Technology," pages 27-40, from Appropriate Technology: Problems and Promises, and explain that it should be read before the next cookstove session.

Trainer Notes

The next cookstove session (Phase II: Session 25) requires a participant volunteer to facilitate a discussion of the above reading assignment.

Select that participant/facilitator at this time. Review the activities in Session 25 with him/her, paying special attention to the Trainer Notes under Step 2. Give the participant/facilitator a copy of the following questions for discussion:

* What were some of the important issues raised in the reading?

* What does the statement "appropriate technology is community technology" mean?

* How would you go about verifying that your perceptions of a village's needs correspond with the felt needs of villagers?

Explain that these discussion questions should be used as guidelines for the up-coming discussion.

COOKSTOVE DEVELOPMENT AND INNOVATION

Total time: 2 hours

Objectives:

- To identify and discuss issues of cookstove development and innovation
- To discuss past experiences with cookstove development and innovation

Resources:

- Jequier, Appropriate Technology: Problems and Promises, pp. 27-40 (previously assigned reading)
- Evans and Boutette, Lorena Stoves, pp. 120-129

Materials: Newsprint and felt-tip pens or chalkboard/chalk

Trainer Notes

This session requires some preparation. Choose one of the options outlined in Step 3 and plan accordingly. Step 2 of this session is designed to be facilitated by a participant. This participant/facilitator was selected and briefed during the previous cookstove session (See Phase II: Session 24/2, Step 5, Trainer Notes).

Procedures:

Step 1. (5 minutes)
Review the session objectives and outline the activities.

Step 2. (25 minutes)
Have the participant/facilitator guide a discussion of the reading material assigned in Phase II: Session 24/2 (Jenquier, pages 27-40).

Trainer Notes

Some important points that should be covered include:

- The importance of initiating the process of development at the local level
- The participation of villagers in defining their needs vs. the technical experts' perceptions of what the villagers needs are
- The participation of local people as the foundation for building self-confidence and local problem-solving capabilities

Allow time at the end of the discussion for feedback on the facilitation skills of the participant/facilitator.

Step 3. (30 minutes)
Have the participants read pages 120-129 in Lorena Stoves, "A Socio-Cultural Assessment of the Lorena Stove and Its Diffusion in Highland Guatemala."

Trainer Notes

An option to the reading from Lorena Stoves is to examine and discuss Peace Corps stove programs in various countries (i.e., the Philippines, Senegambia, the Dominican Republic, etc.). If you have access to information (case studies, etc.) or first-hand experience of these programs, this would be a good opportunity to share and discuss this information with the participants. It will help increase their understanding of programs in which they might eventually be a part.

If you decide to choose this option, disregard Steps 3-5 and use the remaining 1-1/2 hours to examine and discuss some Peace Corps stove programs.

Step 4. (55 minutes)
Have a participant volunteer facilitate a discussion of the reading material.

Trainer Notes

Explain that the participant/facilitator should use the same questions to guide this discussion that were used to guide the previous one (Phase II: Session 24/2, Step 4, Trainer Notes.

The following points should be raised during the discussion:

* The need to incorporate women, as cookstove users, in the design and construction process (and generally throughout the development process)

* That training of villagers should focus on stove principles and processes so that people can apply them to suit their needs

* That the training of villagers should emphasize stove operation and maintenance as well as design and construction

* That cookstove development programs must include local follow-up for repair, evaluation and dissemination of cookstove design modifications developed on the basis of evaluation

Continued

Trainer Notes/Continued

- That follow-up is essential to the development of stoves that respond to local needs and conserve fuel, and to insure that important technical principles are not forgotten

Allow time at the end of the discussion for feedback on the facilitation skills of the participant/facilitator.

Step 5. (5 minutes)
Conclude by having a participant summarize the key points raised in both discussions.

COOKSTOVE INFORMATION AND RESOURCES/ EVALUATION OF COOKSTOVE TRAINING

Total time: 2 hours

Objectives:

* To identify and discuss resources and information for cookstove projects

* To evaluate the cookstove training

* To clean up the cookstove work area

Resource: Aprovecho Institute, "Cookstove News, Vol. 1, No. 1, 2, 1981,pp. 8-12

Materials: Newsprint and felt-tip pens or chalkboard/chalk

Procedures: Step 1. (5 minutes)
Review the session objectives and outline the activities.

Step 2. (25 minutes)
Discuss potential sources of information and resources for cookstove projects.

Trainer Notes

Explain that it is important to know how and where to obtain financial, material and technical information and/or resources for cookstove projects.

Mention that in "Cookstove News," Volume I/Number 1, pages 8-12, they will find a list of individuals and organizations currently working in stove programs worldwide. (All issues of "Cookstove News" list information and resources of interest to cookstove programs.)

Stress the importance of exchanging information, ideas and resources with other stove programs.

Step 3. (30 minutes)
Have the participants evaluate the cookstove training.

Trainer Notes

Choose one of the following options for carrying out the evaluation:

Option A:

Ask the participants what they felt was positive about the training and what suggestions they would have for improving it.

Continued

Trainer Notes/Continued

List their responses on newsprint in two columns, one entitled "Positive Aspects," and the other entitled "Suggestions for Improvement." Encourage questions, comments and discussion.

Option B:

Have the participants form small groups. Ask each group to develop a list of "Positive Aspects" and "Suggestions for Improvement." Then have the groups share their lists with each other, discussing and clarifying them with questions and comments.

Step 4. (1 hour)
Have the participants clean up the work area, tools, etc.

PHASE III: PEDAL/TREADLE POWER

Health and Nutrition

The Role of the Volunteer in Development

	DAY 1	DAY 2	DAY 3
A.M.	SESSION 1: Maternal and Child Health, Part 1 (Skill Area II) SESSION 2: The Path of the Sun (III)	SESSION 5: Classical Mechanics: Principles of Pedal/Treadle Power (III) SESSION 6: Use of Appropriate Aids to Communication (IV)	SESSION 9: Introduction to Design (III)
P.M.	SESSION 3: Introduction to Pedal/Treadle Power (I & IV) SESSION 4: Design Considerations for Pedal/Treadle Devices (I & III)	SESSION 7: Maternal and Child Health, Part 2 (II) SESSION 8: Part 1 - Familiarization with Parts and Tools Part 2-Familiarization with the Bicycle (III)	SESSION 10: Presentation of Designs (IV) SESSION 11: Construction of Pedal/Treadle Devices (III & IV)

	DAY 4	DAY 5	DAY 6
A.M.	Construction (continued)	Construction (continued) SESSION 12: Blacksmithing and Metal Work (IV)	Construction (continued)
P.M.	Construction (continued)	SESSION 13 Appropriate Technologies for Health (II & IV) SESSION 14: Case Studies in Community Health (III)	

	DAY 7	DAY 8	DAY 9
A.M.	Independent Study	SESSION 16: Heat Transfer (III)	SESSION 19: Volunteer in Development, Part 1: Women in Development (I & III)
A.M.	Construction (continued)	SESSION 17: Role of the Volunteer in Development: International Development, Part 1: The Green Revolution (II & III)	Independent Study
P.M.	Construction (continued)	SESSION 18: Presentation of Pedal/Treadle Powered Devices (III)	SESSION 20: Mid-Program Evaluation (V)
P.M.	SESSION 15: Preparation for Pedal/Treadle Presentations (IV)		

MATERNAL AND CHILD HEALTH: PART 1

Total time: 2 hours

Objectives:

- To identify and discuss signs and conditions of malnutrition and illness
- To discuss reasons for "high risk" health conditions among mothers and children in developing countries

Resources:

- Werner, Where There Is No Doctor, pp. 245-282, 283, 294 and 295-321
- Jelliffe, Child Nutrition in Developing Countries, Chapter V
- Attachment III-1, "Clinical Signs of Kwashiorkor and Nutritional Marasmus"
- Attachment I-9/3-A, "The Four Roles for a Structured Meeting"

Trainer Notes

Refer to the Health and Nutrition bibliography for additional resources on maternal and child health.

Materials: Newsprint and felt-tip pens, projector and screen (optional), relevant visual aids: photos, stories, music (See Trainer Notes, Steps 1 and 2)

Procedures: Step 1. (20 minutes)
Introduce the session by setting a climate.

Trainer Notes

It is effective to use some innovative communication tools to introduce this session. Recorded songs by women or children at work or play, sketches, stories, personal accounts by women talking about life and well-being, a film such as is listed in the resources, all serve to offer glimpses into the realities faced by women and children. It is particularly effective if the film, song, story, etc. originate from the country in which the participants will be serving as Peace Corps Volunteers.

Step 2. (15 minutes)
Have the participants form small groups and distribute several photographs of malnourished children to each group. Encourage discussion within the groups.

Trainer Notes

Post the following questions on newsprint and explain that they are intended to help guide the group discussions:

* What does the picture show?
* What response does it evoke?
* Why is this condition present?
* What can be done about it?
* How can Volunteers assist?
* What information is needed to better understand the conditions we see?

Refer to Jelliffe, Morley, Cameron for photographs.

Step 3. (15 minutes)
Reconvene the groups and have them share their responses to the photographs.

Step 4. (15 minutes)
Present a brief talk on maternal and child health risks in the Third World and distribute and review Attachment III-1, "Clinical Signs of Kwashiorkor and Nutritional Marasmus."

Trainer Notes

In your brief talk, it is suggested that you cover the following points:

* High risk groups: pregnant women, lactating women, infants and young children to five years

* Degenerative and infectious disease patterns

* Definitions of states and signs of malnutrition: PCM, Marasmus, Kwashiorkor, deficiencies

* Birth to school-age health needs

A recommended resource for preparing the talk is Jelliffe, Child Nutrition in Developing Countries.

Step 5. (10 minutes)
Have participants brainstorm a list of ideas why women and children are considered "high risk." List the responses on newsprint.

Trainer Notes

Encourage a focus on issues, not specific diseases. Ideas may include:

- Need for or lack of nutrients in daily diet
- Changing patterns of eating
- Poverty
- No access to land
- Tradition

Step 6. (10 minutes)
Have the group list responses to the following question: What do you think are some specific diseases or conditions from which women and children suffer in developing countries?

Trainer Notes

Some examples might be: colds, respiratory ailments, pneumonia, starvation, blindness, pellagra, rickets, anemia, hemmorhage, infection, diarrhea, dehydration, measles, mumps, chicken pox, tooth decay, bewitchment, mental illness, poisoning from chemicals, etc.

Step 7. (15 minutes)
Have the participants compare and discuss the relationships between the risk factors listed in Step 5 and the specific diseases listed in Step 6.

Trainer Notes

Stimulate discussion by asking:

- Which diseases appear to be associated with a number of risk factors?
- Which risk factors seem to influence most directly health or illness?
- Can we make any generalizations?

Step 8. (5 minutes)
Have the participants form interest groups and develop presentations on potential volunteer strategies for responding to maternal and child health care issues and related illnesses.

Trainer Notes

Explain that each interest group should select one topic for investigation and research and be prepared to present their conclusions and recommendations in the next Health and Nutrition session.

As guidelines, mention that the presentations should:

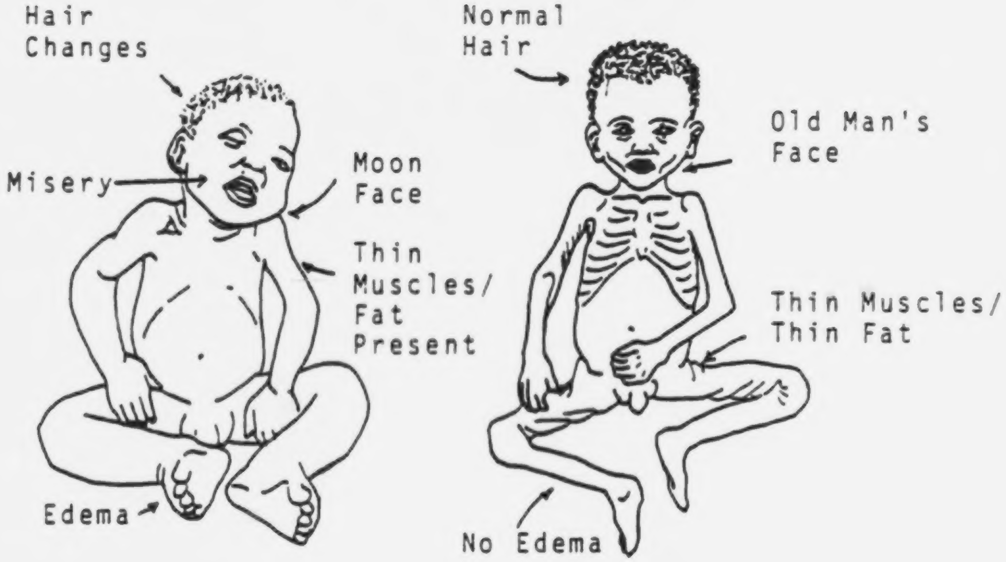
- Use the "Four Roles for a Structured Meeting," from Attachment I-9/3-A
- Include economic, cultural, political, environmental and medical factors

Suggest topics for the interest groups (i.e., bottle baby syndrome, chemical dumping, female circumcision, taboos (sexual and dietary), labor, etc.

Present any available resources that would be helpful for the group's investigations.

Step 9. (5 minutes)
Briefly review the session objectives.

CLINICAL SIGNS OF KWASHIORKOR AND NUTRITIONAL MARASMUS


Hair Changes
Misery
Moon Face
Thin Muscles/ Fat Present
Edema
Normal Hair
Old Man's Face
Thin Muscles/ Thin Fat
No Edema

Underweight

KWASHIORKOR

Very Underweight

NUTRITIONAL MARASMUS

THE PATH OF THE SUN

Total time: 2 hours

Objectives:
- * To determine the path of the sun during the day and its changes during the year
- * To read a sun chart in order to find the azimuth and altitude of the sun to within 3°

Resources:
- * Bennett, Sun Angles for Design, pp. 27-53
- * Mazria, Passive Solar Energy Book, pp. 5-13, 302-338
- * U. S. D.O.D., Magnetic Variation Map of the World
- * Attachment III-2-A, "Finding Azimuth"
- * Attachment III-2-B, "Reading a Sun Chart"

Materials: Sun angle charts for the latitude of the training site and the latitude of each participant's country (See Trainer Notes, Step 6), sun angle calculator, heliodon, newsprint, felt-tip pens, tape, thumbtacks

Trainer Notes

The sun angle calculator can be purchased from Zomeworks Corporation, Box 712, Albuquerque, New Mexico 87103 ($60.00). The heliodon plans can be purchased from Farallones Institute Rural Center, 15290 Coleman Valley Road, Occidental, California 95465 ($3.00).

Procedures: Step 1. (5 minutes)
Present the objectives and describe the session activities.

Step 2. (20 minutes)
Using the sun angle calculator and the heliodon, demonstrate how to determine the paths of the sun at the training site and distribute the sun angle charts for the latitude of the training site.

Trainer Notes

Once you have set the sun angle calculator to the latitude of the training site, have a participant describe the sun's daily path at several different times of the year.

Continued

Trainer Notes/Continued

Point out:

* The azimuth (compass reading) of sunrise
* The altitude (height above the horizon) at noon
* The azimuth of sunset for the time of year during training
* The equinoxes
* The solstices

Some sample questions for discussion include:

* What are the two days of the year when the sun rises due east and sets due west?
* Does this hold true for all latitudes?
* How can you calculate the altitude of the sun at noon during the equinoxes?
* What does "equinox" mean?
* What direction should a solar collector face at the training site?
* What would be the tilt of the collector optimal summertime collection, optimal wintertime collection and for year-around collection?

Step 3. (20 minutes)
Discuss the path of the sun at the equator.

Trainer Notes

Move the visor of the sun angle calculator to the vertical position (that of the equator) and ask:

* What can you say about the day-length on the equator?
* What direction would a solar collector face on the equator for optimal collection March through September? September through March? For year-around collection?

Step 4. (10 minutes)
Post the magnetic variation map of the world on the wall and have the participants find the latitude or range of latitudes for the country in which they will be serving.

Step 5. (15 minutes)
Distribute and discuss the participant's host country sun angle charts and describe how a north latitude sun chart can be converted to a south latitude sun chart.

Trainer Notes

Prior to this session, you should determine the latitude or range of latitudes for each country and prepare one or two copies of the appropriate sun chart (Bennett, pp. 27-53) for each participant.

For example, if five participants are going to Zaire (which ranges from 0° to 4° north latitude) and you want each participant to have two copies of each latitude, make 10 copies of 0° and 10 copies of 4° sun charts.

* To change a northern latitude sun chart into a southern latitude sun chart, invert the sun paths shown on the chart (June 21 changes with December 21; July 23 and May 20 change with November 22 and January 21, etc.) and invert the horizontal axis, solar azimuth (degrees) so that the numbers read: 180, 160, 140, 120, 100, 80, 60, 40, 20, 0/360, 340, 320, etc.

* Sun charts for latitudes near the equator can be confusing because it looks as if the sun path goes off the chart to the left. You can clarify this by pointing out that the sun path continues by coming back onto the chart from the right.

* Explain that the sun charts are a two-dimensional representation of a hemisphere, so that when the sun path (which travels through the three-dimensional hemisphere) is transferred onto them, some liberties must be taken.

Step 6. (20 minutes)
Distribute and review Attachment III-2-A, "Finding Azimuth," and discuss the magnetic variation at the training site.

Trainer Notes

* This attachment is made for the San Francisco area of California, U. S. A. It is recommended that if this training is done elsewhere, a new Attachment III-2-A be made prior to this session using information found on the Magnetic Variation Map of the World. Attachment III-2-A can be used as a guide.

* Explain the reason for a magnetic variation and the difference between an eastern and western variation, using the attachment as a guide.

Step 7. (10 minutes)
Have a volunteer find the magnetic variation for the country in which he/she will be serving on the map of the world and indicate it to the group.

Step 8. (10 minutes)
Distribute Attachment III-2-B, "Reading a Sun Chart," and have the participants read the instructions and complete it.

Trainer Notes

Allow the participants to work in groups of two or three to complete this attachment. This helps people to learn, reduces competition and strengthens the cooperation of the group.

Step 9. (5 minutes)
Have the group discuss and explain their sun chart computations.

Trainer Notes

* Let the participants determine the answer. Then check to see if it's correct.

* Allow participants to make their own corrections.

* Explain that it is important to be able to read the sun chart in order to site a solar collector so that it is not shaded during critical hours.

* Remind the participants that shade mapping and solar siting will be done in Phase IV: Session 8 and that the sun charts will be needed at that time.

ATTACHMENT III-2-A

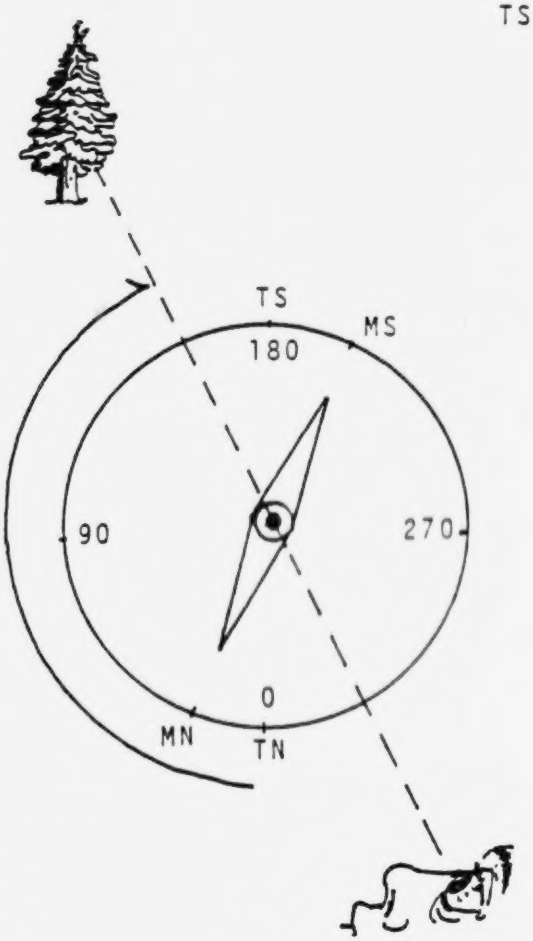
FINDING AZIMUTH

The magnetic variation of the training site is 17°E. This means that Magnetic North is 17° east of True North. It also means that True South is 17° east of Magnetic South (see illustration). The magnetic variation of your host country will be different. It can be found on the Magnetic Variation Map of the World.

The illustration shows the placement of a compass to show the corrected azimuths. By lining up the three points of your eye, the center of the compass and the potential shading obstacle, you can find the azimuth of that obstacle. The angle of the obstacle is found by reading from True North (160° in the illustration).

Key

MN = Magnetic North
MS = Magnetic South
TN = True North
TS = True South



ATTACHMENT III-2-B

READING A SUN CHART

Instructions:

Using a sun angle chart for the training site, find the compass direction (azimuth) and angle above the horizon (altitude) of the sun for the dates and times shown. Answers should be within 3° of the group consensus answer to be correct, since the chart is small and some answers must be interpolated.

Given:

Date . . . 12/21 . . 3/20 . . 4/10 . . 7/24 . . 6/17 . . 9/30

Time . . . 10 am . . 3 pm . . 11 am. . 4 pm . . 8 am . . noon

Find:

Azimuth. . . . .

Altitude . . . .

INTRODUCTION TO PEDAL/TREADLE POWER

Total time: 2 hours

Objectives:

* To discuss and share past experiences with pedal/treadle power

* To discuss the history of technology and innovation and the history of the development of pedal/treadle devices as a renewable energy technology

* To identify and categorize pedal/treadle devices

Resources:

* Jequier, Appropriate Technology: Problems and Promises, pp. 13-17

* McCullough, Pedal Power, pp. 1-25

* Darrow, Keller & Pam, Appropriate Technology Sourcebook, Vol. I and II

Materials: Newsprint and felt-tip pens

Trainer Notes

To help illustrate your talk in Step 3 of this session with pictures of treadle and pedal devices, refer to the resources listed above and select several of the illustrations found in them. These pictures should be distributed to the participants.

Procedures: Step 1. (25 minutes)
Ask the participants to form small groups. Have each group discuss and record their past experiences and/or knowledge of pedal/treadle power.

Trainer Notes

Explain that each group should list on newsprint what pedal/treadle devices they have seen and what devices they have read about.

Step 2. (30 minutes)
Reconvene the groups and have them discuss their experiences and knowledge of pedal/treadle power.

Trainer Notes

Be certain that each group posts their list of devices. Leave the lists posted. They will be referred to again in Step 4.

Step 3. (50 minutes)
Give a brief talk on the history of technology and innovation and the history of the development of pedal/treadle power as a renewable energy technology, mentioning some of its different applications along with some specific examples of successful devices.

Trainer Notes

Background material for this talk can be found on pp. 13-14 of Jequier and pp. 1-25 of McCullough. During the talk, distribute copies of the illustrations of pedal/treadle devices (found in the session resources) and briefly describe each one. At the end of the talk, encourage questions, comments or discussion.

Step 4. (15 minutes)
Have the participants categorize the devices listed by the groups in Step 1 and the devices introduced during the talk in Step 3.

Trainer Notes

The devices can be placed into the general categories:

- Agricultural tools
- Shop tools
- Home implements
- Transportation

Post these categories on newsprint and list the devices under them.

Step 5. (10 minutes)
Conclude the session by reviewing the objectives and mentioning that participants should consider the devices listed as possible construction projects during this phase.

DESIGN CONSIDERATIONS FOR PEDAL/TREADLE POWER

TOTAL TIME: 2 hours

Objectives:
- * To list and discuss criteria for the selection of a technology
- * To identify and discuss technical and cultural factors to be considered when designing an appropriate pedal/treadle device

Resources: Attachment II-5-B, "Criteria for the Selection of Technology"

Materials: Chalkboard or newsprint and felt-tip pens

Procedures: Step 1. (5 minutes)
Have the participants name two or three common manufactured items that they might choose for use in their everyday lives.

Trainer Notes

These items could be just about anything: an automobile, a pair of shoes, a tool, etc.

Step 2. (20 minutes)
Brainstorm a list of the technical and cultural criteria that one might use in choosing each item.

Trainer Notes

In the case of an automobile, for example, the criteria list might be:

Automobile

Technological Criteria	Cultural Criteria
Durability	Style
Ease of repair	Status
Etc.	Etc.

Step 3. (20 minutes)
Have participants examine the criteria lists and suggest any changes, additions or deletions which would be necessary when considering the design of pedal/treadle devices.

Trainer Notes

Explain that essentially the lists would remain the same.

Step 4. (60 minutes)
Distribute Attachment II-5-B and discuss the implications which arise when the issue of "appropriateness" is introduced as a selection criteria.

Trainer Notes

Encourage the participants to compare and contrast the criteria identified earlier in the session with the criteria outlined in the attachment.

Step 5. (15 minutes)
Conclude and summarize the session by reviewing and discussing the objectives.

Trainer Notes

- As a summary point, explain that along with the technical appropriateness of a technology, various socio-cultural issues play an essential role as selection and design considerations.
- Explain that this basic point should provide the context for decisions made during the design and construction component of this phase.
- The next session requires that three participants volunteer to do presentations of mechanical principles. Take time to select these volunteers now. Explain to them the procedures for the next session (See Session 5 for details, procedures and attachments).

CLASSICAL MECHANICS: PRINCIPLES OF PEDAL/TREADLE POWER

Total time: 2 hours

Objectives:

- To demonstrate and discuss the mechanical principles of torque, momentum, inertia and sprocket ratios
- To discuss the application of these mechanical principles to pedal/treadle-powered devices
- To practice facilitation skills

Resources:

- Meriam, Mechanics
- Attachment III-5-A, "Demonstration of Torque"
- Attachment III-5-B, "Demonstration of Momentum and Inertia"
- Attachment III-5-C, "Demonstration of Sprocket Ratios"
- Attachment III-5-D, "Ratio Designs" Worksheets

Materials: Newsprint and felt-tip pens; materials listed in attachments.

Trainer Notes

This session will require advance preparation. Part of this preparation should have been made at the end of Session 4 with the selection of three participants to present the demonstrations in this session. Each of the three participants/facilitators should choose one of the three demonstrations and be provided with the corresponding attachment. (See Resources.)

Be certain to allow sufficient time before the session for the facilitators to prepare their demonstrations and provide them with the materials necessary. If the participant feels that he/she can present the principle in a more effective manner, encourage the development of that demonstration. Explain they they have 15 minutes to present the demonstration and 20 minutes for follow-up discussion.

Plan for time at the end of each of the three demonstrations for feedback on the facilitation skills of the individual giving the demonstration. You can encourage this feedback by asking the facilitator what he or she feels was best during the demonstration and where improvements could be made.

Step 1. (40 minutes)
Have the participant/facilitator demonstrate the concept of torque as outlined in Attachment III-5-A.

Trainer Notes

You should fill in any points missed or not covered to your satisfaction during all three of the demonstrations or discussions.

Step 2. (40 minutes)
Have the second participant/facilitator demonstrate the effects of momentum and inertia as outlined in Attachment III-5-B.

Step 3. (40 minutes)
Have the third participant/facilitator demonstrate the principles of sprocket ratios as outlined in Attachment III-5-C.

Trainer Notes

At the end of this session, distribute Attachment III-5-D, the "Ratio Designs" worksheets, explaining that the worksheets should be completed for the next day's session.

DEMONSTRATION OF TORQUE

Through this demonstration, the participants will gain practical understanding and experience with the effects of torque and its relationship to pedal/treadle power devices.

Total time: 40 minutes

Materials: 2 boards of equal length and nails

Procedures: Step 1. (15 minutes/Steps 1-4)
Nail 2 boards together in a V-shape.

Step 2.
Have a participant grasp the two boards at the middle and attempt to pull them apart by opening the V. Point out the force required to move the boards.

Step 3.
Repeat the experiment by having another participant grasp the ends of the boards.

Step 4.
Compare the force required to move the boards when they are grasped at different distances from the juncture.

Note

The conclusion will be that it takes much less force to pull boards apart at the end mark, i.e., equal forces exert more effect on the juncture when they are at a greater distance from it.

Encourage the participants to express the relationship between applied force and the distance at which it is exerted, using the boards as an example. Such a relationship describes torque and may be expressed in the following formula:

torque = force applied x distance of applied force to the point of juncture

Step 5. (20 minutes)
Facilitate a discussion of the methods that might be used to minimize the effects of torque.

Step 6. (5 minutes)
Encourage feedback on your facilitation skills.

DEMONSTRATION OF MOMENTUM AND INERTIA

This demonstration will enable the participants to experience the effects, parameters and relationships of momentum and inertia to pedal/treadle power.

Total time: 40 minutes

Materials: Wheel or disk, axle, 4 weights (total weight approximately equals that of the wheel or disk)

Procedures: Step 1. (15 minutes/Steps 1-5)
Mount the wheel or disk on a shaft so that it can be easily rotated.

Step 2.
Have a participant rotate the wheel at an approximate set speed, taking note of the force required to start it rotating and the time it takes to coast to a stop after the force is withdrawn. Then, have a participant again rotate the wheel up to speed and then try to stop it quickly, noting the force required to stop the motion.

Step 3.
Distribute four weights equally around the outside of the wheel and repeat the procedure.

Step 4.
Ask the participant to note the effects of the added weights.

Note

The conclusion will be that it takes more effort to start the wheel rotating with the added weight but that the wheel rotates freely for a longer time.

Step 5.
Encourage a discussion of the relationships between parameters of momentum (which are the initial weight of the wheel and its added weights), the wheel's rotational velocity and its radius.

Step 6. (20 minutes)
Facilitate a discussion of the application of the principles of momentum and inertia to pedal/treadle design.

Step 7. (5 minutes)
Encourage feedback on your facilitation skills.

DEMONSTRATION OF SPROCKET RATIOS

This demonstration allows the participants to experience the effects, parameters and relationship of sprocket ratio to pedal/treadle power.

Total time:	40 minutes
Materials:	Multiple speed bicycle
Procedures:	Step 1. (15 minutes/Steps 1-4) Put the bicycle in low gear and lift the rear wheel off the ground. Ask the participants to observe how many times the rear wheel rotates for each revolution of the pedal crank.

Step 2.
Change the gear ratio to a higher gear and repeat Step 1.

Note

In the above two steps, ask the participants to observe the relative difference in force necessary to turn the pedal crank.

Step 3.
Have the participants develop the formula which defines the relationship between sprocket sizes and rotation speed.

Note

This relationship is defined as:

$$\frac{\text{size sprocket A}}{\text{size sprocket B}} = \frac{\text{velocity sprocket B}}{\text{velocity sprocket A}}$$

Step 4.
Facilitate a discussion of the potential mechanical advantage when sprockets are oriented in the proper fashion.

Note

The conclusion will be that transferring energy from a small to a large sprocket results in a velocity loss but in a mechanical advantage or gain.

Step 5. (20 minutes)
Facilitate a discussion of the application of the principles of sprocket ratios to pedal/treadle power.

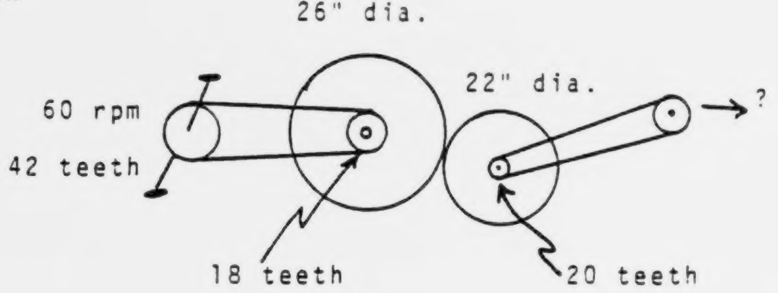
Step 6. (5 minutes)
Encourage feedback on your facilitation skills.

RATIO DESIGNS WORKSHEET

1. Given the mobile dynapod designed to power a food grinder that operates at 100 revolutions per minute, size the sprocket that will be connected to the grinder shaft:

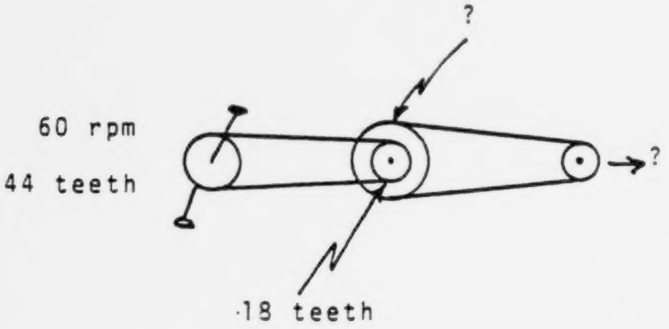
   Available sprockets:

   35 teeth
   42 teeth
   48 teeth
   18 teeth
   22 teeth
   30 teeth


26" dia.
22" dia.
60 rpm
42 teeth
?
18 teeth
20 teeth

2. Given the stationary dynapod, size the two sprockets in question to provide the required 400 revolutions per minute output in low gear on the bicycle.

   1st gear: 1.4/1
   2nd gear: 1/1
   3rd gear: 1/1.4

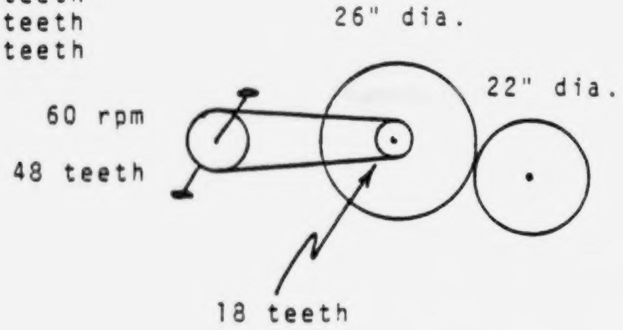

?
60 rpm
44 teeth
?
18 teeth

RATIO DESIGNS WORKSHEET/Continued

3. Design a mobile dynapod unit that will provide the driven output shaft speed of approximately 1,200 revolutions per minute necessary to power a bench grinder. The bicycle used will have a front sprocket of 48 teeth and a rear hub sprocket of 18 teeth.

Available sprockets:

35 teeth
42 teeth
48 teeth
18 teeth
22 teeth
30 teeth



4. Design a system which will deliver power in a linear mode for a water pump designed to operate at 15 cycles per minute. Pedaling speed of 60 revolutions per minute will be used with a belt/pulley combination. The pump has a driving rod throw of 8".

USE OF APPROPRIATE AIDS TO COMMUNICATION

Total time: 2 hours

Objectives:

- To discuss the need for creating relevant audio-visual aids for use in development work
- To identify and list various aids to communication which can be used in developing countries
- To make and use some appropriate aids to communication

Resources:

- Fuglesang, Applied Communication in Developing Countries
- Peace Corps, Visual Aids Number 2
- Pett, Audio-Visual Communication Handbook
- Bertrand, Communications Pretesting
- Attachment III-6-A, "Extension Skills"
- Attachment III-6-B, "Selecting Communication Tools"

Materials: Newsprint and felt-tip pens, a variety of examples of audio and visual aids, i.e. posters, flannel graphs, puppets, games, newsletters, papers, photo novels, comic strips, cassette tapes, slide/tapes, filmstrips, overhead transparencies, etc.

Trainer Notes

The examples listed above are particularly effective if they have been developed for use in a Third World setting and carry messages pertaining to development issues, i.e., health, nutrition, sanitation, literacy, family planning, agriculture, etc.

Procedures: Step 1. (15 minutes)
Begin the session by reading the "Story of the Tsetse Fly" from Applied Communications in Developing Countries, page 13. Then present a short talk on the need for creating relevant audio-visual aids for use in development work.

Trainer Notes

A useful reference source is located on pp. 88-114, "Creating Visual Aids," in Applied Communications in Developing Countries.

Step 2. (10 minutes)
Have participants brainstorm a list of different communication aids that might be applied in development projects.

Step 3. (10 minutes)
Referring to the list, facilitate a discussion of the strengths and weaknesses of different communication aids for use in development work.

Step 4. (20 minutes)
Pass out the different examples of communication aids, briefly describing each one. Encourage any questions or discussion.

Trainer Notes

Also circulate copies of the resource materials for this session and discuss them with the group.

Step 5. (10 minutes)
Distribute Attachments III-6-A, "Extension Skills," and III-6-B, "Selecting Communication Tools," and review them with the group.

Step 6. (55 minutes)
Have participants form small groups and prepare appropriate audio-visual aids for use in the next session.

Trainer Notes

Phase III: Session 7 which follows, "Maternal and Child Health," includes group presentations on health topics.

Encourage the groups to apply what they have learned in this session to prepare for the presentations in the next session, i.e., incorporating a poster or other visual aid, a game, a skit, a song, a script for a radio broadcast, etc.

Also encourage the participants to apply this knowledge in their presentations at the end of technical phases and during the Energy Fair.

EXTENSION SKILLS: Important Points to be Considered for Successful Education and Communication

1. Be prepared. Know what you are doing, where you are going and what you want your audience to know when they leave. Don't prepare your talk an hour before you give it.

2. Always do a practice run of whatever it is you are demonstrating before you get up in front of the group to teach.

3. Start off with a very small chunk of information to be taught. For example, "How to Build a Stove" would be too broad a topic. Change it to "Building the Base."

4. People learn best by doing. The more concrete you can be, the better. For example, if you are doing a talk on how to make a particular type of soup, have everyone make it and taste the soup.

5. People remember main points better when presented with visual aids. Illustrate your main points and use the drawings during your talk. Also, people tend to understand complex or abstract concepts if they can visualize them. Also remember that points or concepts you find simple, others may find difficult. Be sensitive to your audience and explain points thoroughly.

6. Visual aids and/or graphs should be clear, depicting objects with which the people are familiar. Photographs or pictures cut from magazines are often more easily understood than hand-drawn pictures.

7. Changing color and lettering can draw more attention to the visual aids. However, visual aids may be distracting, confusing or misunderstood when they do not mirror people's reality.

8. A vocabulary list of important things, steps and materials in the demonstration can be useful to the demonstrator as well as to the audience.

9. The demonstration should never take place above the audience's line of vision.

10. People remember things that are unusual or make them laugh. But don't overdo it.

11. Physical conditions are important. The demonstration should take place in the lightest part of the room or area. Rooms should be freed of all other distractions. Effort should be made to make everybody physically comfortable, etc.

12. It's better to have an active audience than a passive one.

13. Don't read your material.

14. Keep eye contact with your audience. In this way, you will build a rapport with them. Also, they will feel like you are talking to them and not at them.

15. Respect the audience members who already know how to do the thing that you're demonstrating and get them involved in helping you with the presentation.

16. Repeat the main points. For example, state them at the beginning of your talk, in the middle and at the end. Again the next day, repeat the main points or elicit them from your group before you go into any new information. In other words, build on the previous information.

17. Reinforcement activities following a talk can facilitate learning.

18. Always minimize the cost of the thing being demonstrated, making sure that the people have the economic resources necessary to do it on their own. Try to utilize materials found in the immediate area.

19. When the demonstration involves making something, it is always a good idea to have a finished example to show to the audience.

20. Variety in presentation styles and environment are important.

21. Your talk should contain an introduction that gives a purpose for the information you are going to give. Set the stage for your talk.

22. Try not to use very technical words in the demonstration.

23. Organize your information. For example, time/order, cause/effect, etc.

24. Whenever possible, relate what you are demonstrating to the local customs.

25. Keep your demonstration short and limited to the time of day and amount of time that the people have free.

26. If the demonstration involves several steps, either write or draw them so the audience has something to follow as you go, but be sensitive to the fact that some people do not know how to read or follow diagrams.

27. Try and involve as many of the people's senses as possible: taste, smell, touch, sight, sound.

28. Your personality is important. Smile and be friendly.

29. Speak slowly and clearly. You're probably speaking slowly enough when you think you're going too slow.

30. Don't talk down to your audience. Show them the respect you want them to show you.

31. At the beginning of the demonstration, explain briefly what you are intending to do. At the end, summarize what it is that you have done.

32. Be sensitive to your audience. If they are getting restless, you may be going too fast, going on for too long or they may not be understanding you.

33. BE YOURSELF!

Taken from CHP, Guatemala, Peace Corps Training Facility

Visual Aid	General Description	Recommended Audience Size	Advantages	Disadvantages
Chalkboard	Rigid surface painted green or black on which one can write or draw with chalk.	10 to 30 people. If used with more, a large board is needed and careful audience placement is necessary.	Inexpensive. Can be homemade, easily maintained, minimum of preparation. Used day or night. Audience participation.	Transport can be difficult in remote areas. Limited to the user's artistic ability.
Flannel Board	A piece of flannel, flannelette, terry cloth or felt cloth attached to a rigid surface on which cut-out figures will adhere if backed with flannel or felt cloth, sand paper or glued sand.	15 to 20 people. Audience size depends on the size of the flannel board and the size of the figures that are being used.	Inexpensive. Easily made from local materials. Easily maintained and transported in remote areas. Figures can be used in different presentations. Ideal for showing "sequence of events" and reviewing lesson, as figures can be brought back on the board.	Requires considerable advance preparation. Difficult to use out of doors if there is any wind. Some artistic ability is required if making homemade figures.
Posters	A message on a large sheet of paper, and with an illustration and a simple written message.	No limit, because it is not necessary for everyone to look at a poster at the same time.	Inexpensive. Easy to make. Requires a minimum amount of time to prepare and use. Easy to transport.	Deteriorate rapidly. Can confuse audience with too much or too little information. Need some artistic ability if making own posters.
Flip Charts	Illustrations on paper or cloth, usually larger than 21 cm by 27 cm; bound together with rings or string. They flip over in presentation.	15 to 30 people. Audience size depends on the size of the flip chart illustration.	Inexpensive. Can be homemade and can be easily transported. Good way to give information in sequence; because they are bound, illustrations stay in sequence.	Deteriorate with constant use. Some artistic ability required if making homemade flipcharts.

Visual Aid	General Description	Recommended Audience Size	Advantages	Disadvantages
Flash Cards	Illustrations made on heavy paper that is usually smaller than 21cm by 27cm. The illustrations are not bound but are arranged in sequence.	5 to 15 people. Because the illustrations are small, no more than 15 people should be in the audience.	Inexpensive. Can be homemade. Very easy to transport. Good way to give information in sequence to small groups.	Deteriorate with constant use. Some artistic ability required if making homemade flashcards. Easy to get out of sequence. Limited to small groups.
Bulletin Boards	A surface, at least 3/4m by 1m, into which stick pins can be placed. Drawings, photos and lettering can be displayed on the board.	No limit, because it is not necessary for everyone to look at the bulletin board at the same time.	Inexpensive. Can be homemade from local materials. Good way to present a "changing" message in areas where people gather.	If out of doors, weather damage can occur. Constant supply of good educational material to put on the board is needed.
Demonstration	Using actual ingredients, tools or land, the educator shows how something is done. Either at that time, or soon afterward, each audience member displays an ability to do the new thing.	1 to 30 people. Because it is difficult for an educator to follow up on more than 30 persons, this is the recommended limit.	Excellent way to use actual materials in a real situation. Uses local materials. Easy to understand by people not used to looking at illustrations. Good way to get audience participation.	Takes a lot of planning and preparation.
Film	Color or black & White, 16mm or 8mm cinema film, with sound, projected on a screen or wall.	30 to 100 people. Groups can be larger -- but it is difficult to have any discussion with larger groups.	Dramatic and gets the audience's attention. Shows motion and therefore helps explain step-by-step and time sequence very well.	Very expensive; requires expensive equipment, electricity and dark projection area. Difficult to transport and operate.

Visual Aid	General Description	Recommended Audience Size	Advantages	Disadvantages
Slides	35mm film in plastic or cardboard mounts 5cm by 5cm. In color or black & white, they are projected on a screen or a wall.	About 30 people. Though slides can be used with more people, the educator can stimulate better discussion among a smaller group.	Dramatic, less expensive than cinema film, excellent way to bring distant things to audience and to show time sequence. Battery-operated projectors available. Local photos easily made.	Easy to damage, easy to get out of sequence and project upside down or sideways. Requires projection equipment, needs electricity or batteries and darkened projection area.
Filmstrips	Strip of 35mm film, color or black and white. Photographs in sequence. Filmstrip projected on screen or wall. Uses projector with filmstrip adapter. Filmstrips horizontal or vertical format.	About 30 people. Though filmstrips can be used with more people, the educator can stimulate better discussion with a group of this size.	Dramatic, less expensive than film and slides. Once inserted correctly in projector, impossible to get out of sequence. Can show photos of the real thing and shows sequence in time. Battery-operated projectors available. Relatively easy to transport.	Requires projection equipment, can be damaged, requires either mains or battery-supplied electricity. (Sometimes batteries are expensive.) Requires darkened projection area. Limited appropriate filmstrips available.

Adopted from WORLD NEIGHBORS IN ACTION newsletter.

MATERNAL AND CHILD HEALTH: PART 2

Total time: 2 hours

Objectives:

- To prepare and give a presentation to the group concerning maternal and child health issues
- To discuss the role of the Volunteer in improving maternal and child health
- To use a structured meeting format

Resources: Refer to Phase III: Session 1, "Maternal and Child Health: Part 1"

Materials: Newsprint and felt-tip pens; presentation guidelines (Phase III: Session 1, Step 8)

Trainer Notes

In this session, groups formed in Phase III: Session 1 will present the results of their investigations into maternal and child health topics. The planning for this session was done in Part 1 (Phase III: Session 1). The groups are expected to use "The Four Roles for a Structured Meeting" as a format for their presentations.

Step 1. (5 minutes)
Briefly introduce the session objectives and outline the activities.

Step 2. (5 minutes)
List the order of the presentations on newsprint and post the presentation guidelines (See Phase III: Session 1, Step 8).

Step 3. (one hour, 30 minutes)
Have the groups give their presentations.

Step 4. (20 minutes)
Discuss the presentations and the success in meeting the session objectives.

Trainer Notes

Have the recorders present their notes from the presentation and ask each process observer to comment on the meeting.

Discuss the session by raising the following questions:

Continued

Trainer Notes/Continued

- * Did speakers keep to the issues and follow presentation guidelines?
- * How do you feel about your role as a Volunteer in relation to issues raised?
- * To what degree can we generalize about each of these issues?
- * Did you learn about issues (or parts thereof) previously unknown to you?
- * What were effective ways people presented information?

PART ONE:
FAMILIARIZATION WITH MATERIALS AND TOOLS

Total time: 1 hour

Objectives:

- To identify and discuss the various tools and material resources available at the training site and/or in the local community
- To discuss the role of available materials in the design process

Materials: All local relevant resources: wood, metal, bearings, ropes, pulleys, pipe, bamboo, fastenings, etc. and the tools to work them

Procedures: Step 1. (5 minutes)
Present the session objectives and review the activities.

Step 2. (10 minutes)
Facilitate a discussion of the importance of taking into account available resources in designing a pedal/treadle device.

Trainer Notes

- Explain that ideally the design of any pedal/treadle or other appropriate technology device should use materials that are available locally.
- Mention that before designing any device, it is important to thoroughly assess what resources will be available.

Step 3. (45 minutes)
Take the group on a tour of the training site and/or local community, explaining and/or demonstrating the uses, qualities and purposes of all available materials and tools.

Trainer Notes

- Encourage a great deal of questions and experimentation so that by the end of the tour, participants are completely familiarized with all available resources.
- You should pay special attention to touring any available workshops, using this time to introduce the topic of shop safety (including location of fire extinguishers, personal safety and proper use of tools).

PART TWO:
FAMILIARIZATION WITH THE BICYCLE

Total time: 1 hour

Objectives:

- To discuss the major issues regarding the promotion and use of bicycle-powered devices in the Third World
- To disassemble a bicycle and identify the parts

Materials: Newsprint, felt-tip pens, bicycles, wrenches, screwdrivers, hammers, etc.

Resources:

- McCullough, Pedal Power
- Cuthbertson, Anybody's Bike Book
- Attachment III-8/2-A, "Bicycle Diagram"

Trainer Notes

- This session is optional and should be used at your discretion, depending upon the extent to which you wish to focus on the use of bicycles during the pedal/treadle phase.
- You should, however, spend some time discussing the issues involved in the use of bicycles in developing countries (See Step 1). Decisions regarding the extent to which bicycles will be emphasized during the phase should depend upon points raised during this discussion.

Step 1. (15 minutes)
Present the session objectives, distribute Attachment III-8/2-A, "Bicycle Diagram," and facilitate a discussion of the major issues involved in the promotion and use of bicycle-powered devices in developing countries.

Trainer Notes

During the discussion you should stress the following points:

- In many developing countries, bicycles are scarce and their primary use is for transportation.
- Given their scarcity and expense, it is unlikely that people would be willing to disassemble their bicycles for use in pedal-powered devices.
- If bicycles are used for power generation, mobile dynapod designs are more suitable than fixed designs.

Keep this discussion as specific as possible to the countries in which the participants will be working.

Step 2. (15 minutes)
Have the participants form small groups. Provide each group with a bicycle and ask that they identify the parts of the bicycle and develop a procedure for disassembling it.

Trainer Notes

Explain that the group members should assist one another in identifying the bicycle parts. When the groups have developed their procedure for disassembly, have each group verify the procedure with you.

Step 3. (30 minutes)
Have the groups disassemble the bicycles.

Trainer Notes

As the groups are working, circulate among them, encouraging participants to help one another and to try working together as cooperatively as possible.

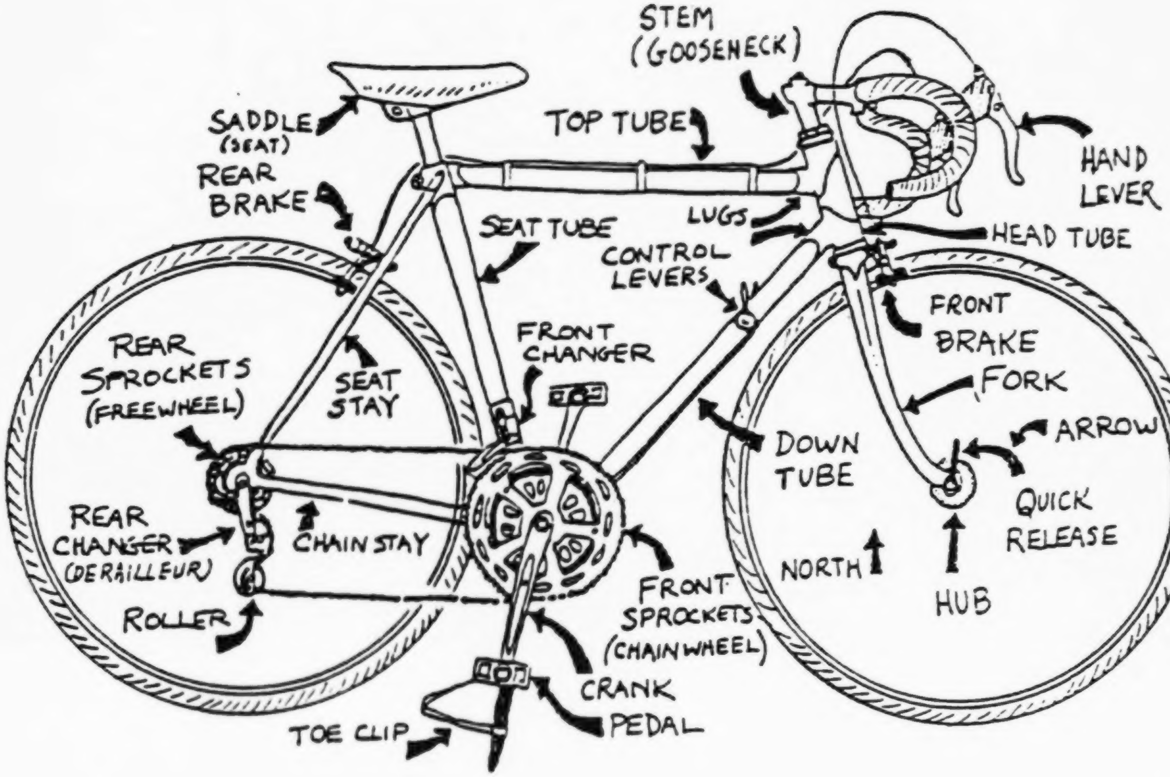
Step 4. (15 minutes)
Reconvene the groups and encourage a discussion of the disassembly activity.

Trainer Notes

Stimulate this discussion by asking the following questions:

- Did you learn anything new about bicycles during this activity?
- Can you think of any ways in which bicycles might be used for generating power in your work as Peace Corps Volunteers?
- Was there anything which occurred during the activity that fostered the development of a sense of cooperation among your fellow group members?

BICYCLE DIAGRAM


STEM
(GOOSENECK)
SADDLE
(SEAT)
TOP TUBE
HAND LEVER
REAR BRAKE
LUGS
SEAT TUBE
HEAD TUBE
CONTROL LEVERS
FRONT BRAKE
REAR SPROCKETS
(FREEWHEEL)
SEAT STAY
FRONT CHANGER
FORK
ARROW
DOWN TUBE
QUICK RELEASE
REAR CHANGER
(DERAILLEUR)
CHAIN STAY
NORTH
HUB
ROLLER
FRONT SPROCKETS
(CHAINWHEEL)
CRANK
PEDAL
TOE CLIP

The above illustration is that of a ten-speed bicycle, which is the most complex type.

Other types, such as single and three-speed, do not have multiple front sprockets and derailleur.

INTRODUCTION TO DESIGN CONSIDERATIONS

Total time: 4 hours

Objectives:

- To review and discuss the different qualities of foot-powered devices
- To review and discuss the basic concepts of the design and construction process
- To design a foot-powered device

Materials: Chalkboard, modeling materials (corks, pins, string, straws, glue, wire, toothpicks, rubber bands, tins, etc.

Resources:

- Attachment III-9-A, "List of Qualities of Foot-Powered Devices"
- Attachment III-9-B, "The Design Process"
- Hommel, China at Work

Trainer Notes

This session should be scheduled at the end of the day so that the participants can continue their design project at home and have it ready for presentation the following day.

Procedures: Step 1. (5 minutes)
Present the session objectives and activities.

Step 2. (30 minutes)
Distribute Attachment III-9-A, "List of Qualities of Foot-Powered Devices." Review the list, encouraging questions, comments and discussion.

Trainer Notes

Explain that the better one can match the incoming energy source to the energy need, the simpler and more efficient the device can be. As an example, discuss the Chinese pedal-powered chain-and-washer pump, noting that the energy type and amount are so well matched to the energy needed that there is no requirement for a power system: it is direct-drive.

While reviewing the list, ask the participants to define the terms "rotary" and "reciprocating." Discuss the possible applications of each drive system and their limitations.

Step 3. (1 hour)
Distribute Attachment III-9-B, "The Design Process," and review the process outlined. Encourage questions, comments and discussion.

Trainer Notes

* Draw Figure "A" from the attachment on the chalkboard. Review the diagram, emphasizing that no design is complete until it has been tested and retested and that every new design requires redesign and rebuilding. Ask the participants to give examples of design and redesign.

* Referring to the attachment (Part II), move the discussion on to the criteria for a design, emphasizing that specific criteria are more useful than general ones. Review the criteria found on the attachment.

* Draw Figure "B" on the chalkboard and explain that it is a more detailed look at the design process. Take the participants through the process, asking them for an example or offering an example. Ask at which point in the process one needs to consider the various qualities of foot-powered devices discussed earlier in the session.

* Conclude the discussion by explaining that they will be using this process in the design of their devices.

Step 4. (2 hours, 25 minutes)
Have the participants form small construction groups and explain that the remaining time should be used to prepare a design based on the criteria list for a foot-powered device that will be presented in the next day's session.

Trainer Notes

* Tell the participants that they will be working with their groups for the remainder of the phase. Explain that since they will be working together, they should be aware of and sensitive to group processes that are occurring. Suggest that they take time periodically to discuss ways in which the group could work together more effectively.

* Explain that each group should prepare a design for presentation during the next session, using models, posters, skits and/or other non-formal education techniques.

* Conclude by explaining that the group will eventually construct and evaluate their designs during this phase.

LIST OF QUALITIES OF FOOT-POWERED DEVICES

Type	Type of Motion	Speed	Power
Bicycle	Rotary	High	High
Treadle	Reciprocating	Medium	Medium
Kickwheel	Rotary	Low	Low
Chinese treadle	Rotary	Medium	Low
Weight shift	Reciprocating	Low	High
Treadmill	Rotary	Medium	Medium
Chinese pedal	Rotary	Low	High
Double treadle	Reciprocating	Medium	High

THE DESIGN PROCESS

I. Overview of the Whole Design Process

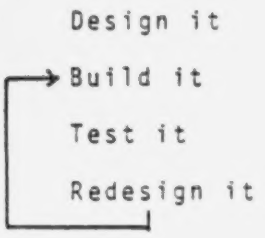

Design it
Build it
Test it
Redesign it

Figure A

II. A Closer Look at the Design Part

Establish criteria. Be specific, for example:
It must be buildable in 20 hours.
It must weigh less than 25 pounds.
It must use only wood.
It must be built only with hand tools.
It must be usable by both sexes, etc.

Establish priorities of criteria.

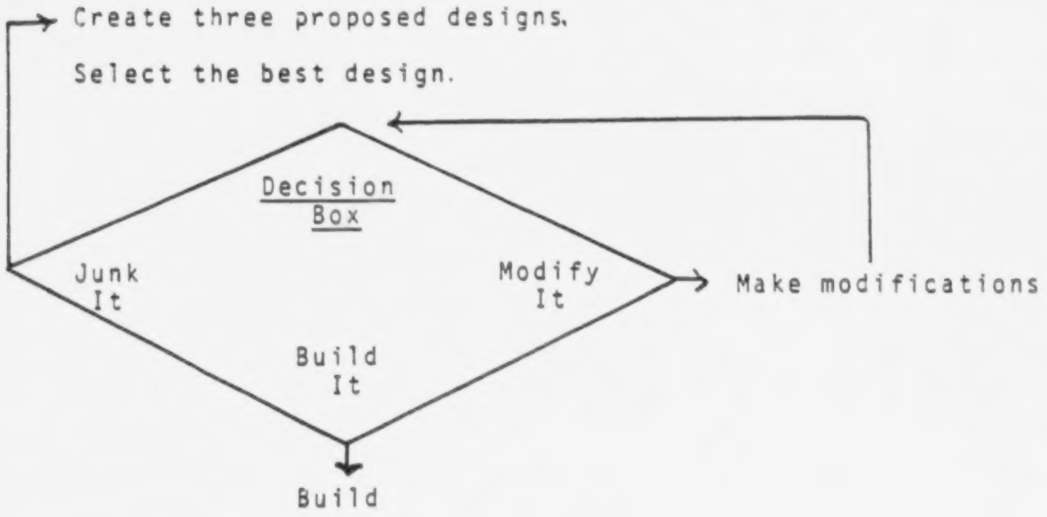

Create three proposed designs.
Select the best design.
Decision Box
Junk It
Modify It
Make modifications
Build It
Build

Figure B

PRESENTATION OF DESIGNS

Total time: 1 hour

Objective: To present and discuss the designs of pedal/treadle devices

Trainer Notes

> Guidelines and preparations for the presentations to be done during this session are explained in Phase III: Session 9.

Resources: Phase Schedule written on newsprint

Trainer Notes

> Before proceeding with this session, the Phase Schedule should be written on newsprint for use in Step 3.

Materials: Newsprint and felt-tip pens

Procedures: Step 1. (5 minutes)
Present the objectives and outline the session activities.

Step 2. (40 minutes)
Have each group present their designs.

Trainer Notes

> Allow time after each presentation to give each group feedback on the presentation and design. Ask people what they liked best about the presentation and the design and what suggestions they might have for improvement.

Step 3. (15 minutes)
Post the Phase Schedule and discuss it.

Trainer Notes

> Point out the remaining pedal/treadle sessions in the phase. Explain that in the next session, they will begin the construction of their devices. Emphasize the importance of careful planning to ensure sufficient time to complete the devices.

CONSTRUCTION OF PEDAL/TREADLE-POWERED DEVICES

Total time: 22 hours

Objectives:

- To use various tools in the construction of pedal/treadle-powered devices
- To build and test a pedal/treadle-powered device
- To recognize and solve problems, both with the construction of the pedal/treadle device and within the group

Resources:

- Darrow and Pam, Appropriate Technology Source Book, Volumes I and II
- McCullough, Pedal Power

Materials: An assorted quantity, quality and variety of: wood, wire, pipe, sheetmetal, bamboo, string, rope, old fanbelts and belt material, gears, bicycle chains, sprockets, bicycles and bicycle parts, nails, screws, nuts, bolts, bearings, leather, PVC pipe, grease, oil, wood and metal-working tools. Newsprint and felt-tip pens.

Trainer Notes

This session requires substantial preparation time for gathering the materials listed.

This 22-hour session allows much latitude for individual trainer styles.

It is not intended that this session should occur over 22 continuous hours. It should be complemented with other sessions such as Health & Nutrition, The Role of the Volunteer in Development and Core Technology sessions (see the Phase III calendar at the beginning of this phase). It is helpful, in fact, to spread the construction time over as many days as possible. This will allow the participants more spare time to discuss the projects outside of session time. However, a four-hour work period should be considered minimum, since tools and materials have to be set up and cleaned later. Six-or eight-hour construction periods are ideal.

Construction naturally follows design. Those groups with complete plans for their device should proceed with construction without waiting for the other groups to finish.

Step 1. (22 hours)
Have the participants form their construction groups and build their pedal/treadle-powered devices.

Trainer Notes

At the beginning of each day of construction, have the participants discuss the events of the preceding day. Focus the discussion on the group dynamics and problem solving methods being used in each group. Allow between 15 and 25 minutes for this activity, depending on the group needs.

It is also helpful to use this time to review the time remaining in the construction session and remind the participants that one hour near the end of the phase will be spent on the development of a presentation for their device (See Phase III: Session 15).

When time begins to get short, encourage the participants to focus on essential tasks only and to divide them among the group members to help speed up the process.

Be certain to keep in touch with how the groups are proceeding during the construction period, taking time when necessary to show people how to properly use and care for tools. Don't intervene every time a group or an individual makes a mistake since mistakes are an important part of the learning process.

Explain that any group finishing one project can (time permitting) go on with another small project or begin preparations for the presentation of their device.

Set aside 10 to 20 minutes at the end of each day's construction period for cleaning the work site and shop area.

At the end of the final construction session, set aside about half an hour for a thorough cleaning of the work site and the shop area.

BLACKSMITHING AND METALWORK

Total time: 2 hours

Objectives:

- To discuss and experiment with blacksmithing and metalwork techniques
- To discuss ways of effectively communicating with a skilled artisan

Materials: As needed by the blacksmith

Trainer Notes

It is important that the participants have a general knowledge of the capabilities and limitations of a blacksmith or metalworker. In-country, a Peace Corps Volunteer may, on occasion, need assistance in the construction of a particular device. Therefore, it is important to adequately understand the fundamentals of blacksmithing in order to properly explain the work needed.

This session will require preparation. You will need to arrange for the participants to visit a blacksmith's shop in order to observe the blacksmith at work and learn some of the fundamentals of working metal: how to heat, work and temper in steel, how the forge works, what tools are needed, etc. The participants should be able to question the blacksmith and ideally have an opportunity to experiment with heating and working metal.

The smaller the group visiting the blacksmith, the better, as it will allow more one-on-one contact between the blacksmith and the participants and greater opportunity for hands-on practice. If the construction group is large, one option is to have the small construction groups stagger their visits to the blacksmith during the construction period. Much of this will depend upon the needs of the blacksmith and the amount of time he/she is willing to spend with the participants.

Resources and materials will be specified by the blacksmith.

Procedures: Step 1. (15 minutes)
Have the participants form their construction groups and develop a list of questions about the blacksmithing trade that have bearing on the construction of their pedal/treadle-powered devices.

Trainer Notes

Try to limit the list of questions to two or three per group to avoid overwhelming the blacksmith with too many questions.

Step 2. (1 hour, 30 minutes)
Reconvene the groups and have the participants visit the blacksmith shop.

Trainer Notes

Explain that during their visit, the participants should learn:

* The different types and qualities of metals, their advantages and disadvantages

* The availability and cost of metal types

* The availability of recycled materials

Also, explain that they should note any key points that they feel should be remembered when communicating with an artisan. Add that they will be discussing these points after their visit. (Also add that this discussion will take place at an appropriate location away from the blacksmith shop.)

Step 3. (15 minutes)
After the visit, have the participants summarize what they have learned about blacksmithing and communicating with a blacksmith. Encourage discussion, comments and questions.

APPROPRIATE TECHNOLOGIES FOR HEALTH

Total time: 2 hours

Objectives:

- To identify and discuss appropriate technologies for infant and child nutrition
- To practice making rehydration formulas and weaning foods
- To develop communication aids designed to promote weaning foods in developing countries

Resources:

- Werner, Where There Is No Doctor, pp. 107-124, 151-161
- Jelliffe, Child Nutrition in Developing Countries, Chapters 6 & 7
- Raphael, "Cultural Factors are Part of the Appropriate Technology for Weaning Foods," in APPROTECH, pp. 9-10
- Attachment III-13-A, "Guidelines for Feeding"
- Attachment III-13-B, "Weaning Foods"
- Attachment III-13-C, "A Measure for the Rehydration Formula"

Trainer Notes

We suggest that you copy some of the weaning food recipes for specific countries to which volunteers are assigned (see Step 2). Refer to Jelliffe for recipes.

Materials: Newsprint and felt-tip pens; several critical photographs (see Trainer Notes under Step 1); cookstoves and food grinders; cooking utensils, pots and pans; water, sugar, salt, grains, legumes, dark green and yellow vegetables, oil

Procedures: Step 1. (5 minutes)
Introduce the session by distributing and discussing selected critical photographs.

Trainer Notes

Effective photographs to focus the discussion have been: a mother force-feeding her infant, or an emaciated infant with a baby bottle.

Continued

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Trainer Notes/Continued

Encourage discussion by asking the following questions:

* What is happening in these photographs?
* What appropriate technologies for health could be applied in these situations?

Step 2. (10 minutes)
Distribute and review Attachment III-13-A, "Guidelines for Feeding," and Attachment III-13-B, "Weaning Foods."

Trainer Notes

At this point, you should also distribute and explain copies of weaning food recipes that are specific to the countries in which the participants will be serving. (See Trainer Notes under Resources.)

Step 3. (10 minutes)
Review the rehydration formula and distribute and review Attachment III-13-C, "A Measure for the Rehydration Formula."

Trainer Notes

Refer participants to Werner, pages 107-124 and 151-161.

Step 4. (30 minutes)
Have participants form small groups and practice making rehydration drinks and weaning foods.

Trainer Notes

* Post a general recipe for mixing and cooking a weaning food on newsprint for all to see.

* Have all foods and implements ready for use.

* Encourage participants to try varying recipes.

* Offer help whenever necessary.

Step 5. (40 minutes)
Briefly reconvene the group and explain that they should continue working in their small groups to develop communication aids designed to promote the use of weaning foods in developing countries.

Trainer Notes

- Have materials available: newsprint, cardboard, pens, etc.
- Stimulate ideas by suggesting: gourd babies to demonstrate dehydration, role-plays, children's stories, cartoon strips, radio or press releases, songs, dances, games, etc.

Step 6. (15 minutes)
Reconvene the groups and have them present and explain their communication aids.

Trainer Notes

- Have the groups discuss ways to use their communication aids.
- Encourage the groups to give constructive feedback and suggestions for improvement of each aid.

Step 7. (5 minutes)
Review the session objectives and summarize the activities.

GUIDELINES FOR FEEDING

1. Breast milk is best.
2. Put a new-born baby to breast as soon as possible.
3. Start feeding thin porridge at four months.
4. At six months, feed plenty of porridge with added protein three times a day.
5. Start the baby on new foods before he has the breast milk. Once he likes it, give it to him after his breast milk.
6. Breast feed a child as long as possible (18 months to two years of age).
7. Stop breast feeding slowly.

* * *

Remember, a young child:

- Needs feeding often
- Needs a special plate
- Needs food to be well mixed
- Needs to be fed with a spoon

WEANING FOODS *

> "It is no exaggeration to say that the most important global target for nutrition education is to persuade tropical parents to feed their children in the early years of life as well as possible with local foods produced in greater quantities in the village."
>
> -D. B. Jelliffe-

Multimixes (4:1 ratios)

Double Mix	Staple + legume or animal protein or dark leafy green vegetable (DLGV)
Triple Mix	Staple + legume and animal protein or DLGV
Quadri Mix	Staple + legume and animal protein and DLGV

* * *

Weaning foods should be:

- Well cooked
- Soft and mashed
- Offer compact calories and protein

---

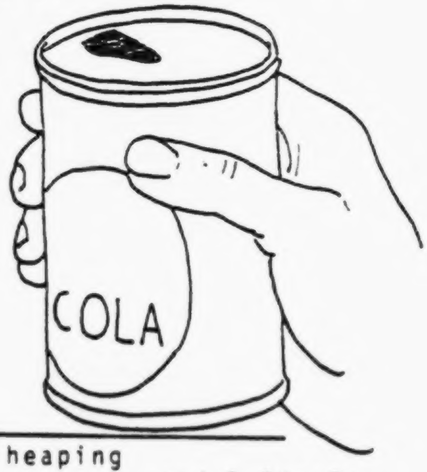
* Weaning = to accustom

A MEASURE FOR THE REHYDRATION FORMULA

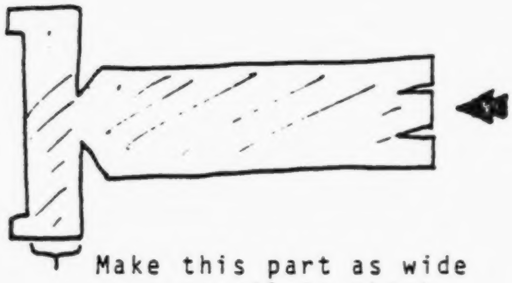
How children can make measuring spoons for preparing a SPECIAL DRINK to protect a child with diarrhea.

Children can make measuring spoons from many things, but it is important that they measure more or less the right amount of sugar and salt.

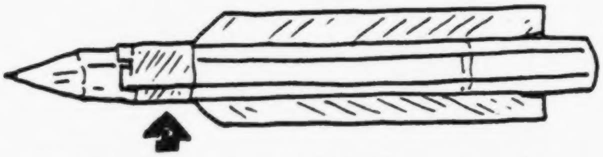
Here is one way to make spoons using things that have been thrown away.



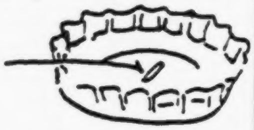
1. Cut a juice or beer can to this shape. (It's easy with scissors.)



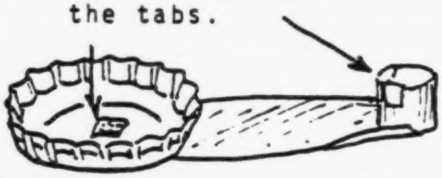
Make this part as wide as a pencil is thick.



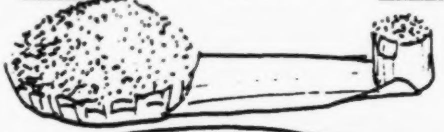
2. Wrap this part tightly around a pencil.

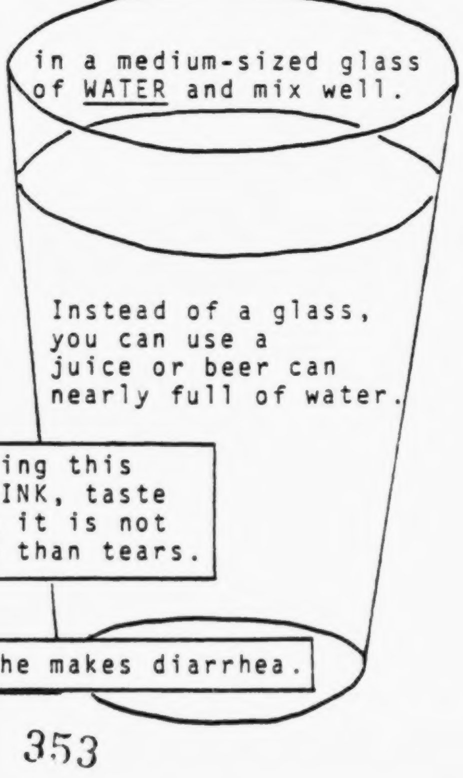


3. In the middle of a bottle cap, make a small cut.
4. Join the pieces and bend over the tabs.



Put 1 heaping bottle cap of SUGAR, and 1 little spoon of SALT





in a medium-sized glass of WATER and mix well.

Instead of a glass, you can use a juice or beer can nearly full of water.

Before giving this SPECIAL DRINK, taste to be sure it is not more salty than tears.

Give the child one glass of SPECIAL DRINK for each time he makes diarrhea.

From Hesperian Foundation.

CASE STUDIES IN COMMUNITY HEALTH

Total time: 2 hours

Objectives:

- To examine several case studies/films that describe various community health strategies
- To discuss some characteristics of community health strategies
- To select topics for presentations during the next health session

Resources:

- Werner, Where There Is No Doctor, pp. W1-W29
- Brownlee, Community, Culture and Care, pp. 136-154 and 214-262
- The Hesperian Foundation, "Health Care by the People, " a film
- World Health Organization, Film #13,"Health for All - Sankofa Tradition and Development"
- Werner, The Village Health Worker - Lackey or Liberator?
- World Health Organization, "World Health - Traditional Medicine"
- World Health Organization, "Appropriate Technologies for Health," newsletters.

Trainer Notes

It is useful, where possible, to locate some case studies for participants to review as additional reading. There are a number of good publications, such as "World Education Reports" and "Pan American Health," that are widely available and offer short articles on community health projects and systems in the developing world.

Before presenting this session, you will need to order the two films listed in the resources (see Steps 2 and 4).

Materials: Film projector and screen, newsprint and felt-tip pens

Procedures: Step 1. (5 minutes)
Review the session objectives and outline the activities.

Step 2. (35 minutes)
Show a film which illustrates a successful community health strategy.

Trainer Notes

- Refer to the resources for two films that have been very effective or substitute other films as desired.
- If the films are not available, an option is to locate written examples of case studies and have the participants review them.

Step 3. (15 minutes)
Have participants discuss their impressions of the film and identify some of the characteristics of community health strategies illustrated in the film.

Trainer Notes

The following questions can focus the discussion:

- Can you determine the philosophy of health?
- Is the health approach preventative, curative or both?
- Are health workers indigenous or foreign?
- What is the role of the traditional practitioner?
- Are traditional and modern health approaches integrated?
- Are appropriate technologies for health a part of the health system?

Step 4. (40 minutes)
Show a second film (or discuss another written case study).

Trainer Notes

For contrast, it is effective to show a second film (or read a second case study) which illustrates an unsuccessful health strategy.

Step 5. (15 minutes)
Invite comments about the film and have the participants identify characteristics of the community health strategy illustrated.

Step 6. (10 minutes)
Describe the plan for the next session and have participants form small interest groups to select topics for presentation.

Trainer Notes

Explain that their topics should be researched and that ten-minute presentations should be prepared for Phase V: Session 13.

Encourage participants to use appropriate communication aids in their presentations (i.e., role plays, visual aids, etc.).

Participants should first review Werner, pages W1-W29, and Brownlee, pages 136-154 and 214-262 for background information.

Effective topics that have emerged from past film discussions include:

- Village-based health workers or imported health teams
- Preventative vs. curative approaches to health
- Role of traditonal practitioners
- Philosophy of self-help health
- Integration of traditional and modern health systems
- Appropriate technologies for health
- Role of Volunteer in community health systems

PREPARATION FOR PEDAL/TREADLE PRESENTATIONS **

Total time: 1 hour

** This session should be scheduled at the end of the day so that the participants are able to finish the work during the evening hours.

Objectives:

- * To plan and design a presentation of a pedal-powered device
- * To identify and use techniques for communicating complex technical concepts to informally educated people

Resources: Fuglesang, Applied Communication in Developing Countries, pp. 43-52

Materials: Newsprint and felt-tip pens

Trainer Notes

Copies of the resource material should be prepared for distribution during the session.

Remember to schedule this session at the end of the day so that participants are able to finish the work during the evening.

Procedures:

Step 1. (5 minutes)
Present the session objectives and outline the activities.

Step 2. (10 minutes)
Distribute a copy of Fuglesand to each participant and have them read it.

Step 3. (15 minutes)
Have the participants brainstorm and discuss a list of ways to present their devices to informally educated people.

Trainer Notes

Write the list on newsprint. It should include some of the following nonformal education techniques: skits, puppets, songs, pictures, games, diagrams, slide shows, models, etc.

Encourage the participants to describe how these techniques could be used to explain a complex technical concept.

Step 4. (10 minutes)
Have the participants identify which techniques would be most appropriate for their presentations.

Step 5. (20 minutes)
Have the participants form their construction groups and develop a presentation of their pedal/treadle devices.

Trainer Notes

* Explain that each group should develop a twenty-minute presentation and that it should be designed to be understood by people with little or no formal education.

* Point out that informally-educated people may have difficulty understanding the mathematics of pedal/treadle concepts but if they are familiar with bicycles, they will probably understand the principles of leverage, wheels, fly wheels, momentum, inertia, rhythm, etc.

* Explain that they should continue to plan and practice their presentations tonight and that they should be prepared to give them tomorrow.

HEAT TRANSFER

Total time: 2 hours

Objectives:

- To define and discuss the different types of heat transfer
- To demonstrate types of heat transfer using non-technical language

Resources:

- Anderson, The Solar Home Book, pp. 62-74
- Mazria, Passive Solar Energy Book, pp. 5-20, 28-43

Materials:

- Heat source (sun, infrared lamp, burner at low heat, etc.)
- Various metals (iron, steel, lead, copper, aluminum, etc.)
- Glazing materials (glass, vinyl, polyethylene, etc.)
- Insulation materials (newspaper, cardboard, straw, etc.)
- Building materials (stone, brick, adobe, etc.)
- Thermometers, newsprint, felt-tip pens
- Model solar water heater and food dryer

Trainer Notes

This session requires substantial preparation to gather all of the materials listed above.

Procedures:

Step 1. (5 minutes)
State the objectives and outline the session activities.

Step 2. (15 minutes)
Define and discuss the three types of heat transfer: radiation, conduction and convection.

Trainer Notes

Encourage the participants to come up with their own definitions of the three types of heat transfer. (Since they have defined them in Phase III: Session 7, "Earthen Stoves," they should have little difficulty in forming a definition.)

Continued

Trainer Notes/Continued

Post the definitions on newsprint as they are formulated.

Ask for the differences in heat transfer between cookstoves and solar devices, such as water heaters and food dryers.

Step 3. (40 minutes)
Have the participants form small groups and develop demonstrations to describe one or two types of heat transfer.

Trainer Notes

* Mention that the demonstration should use simple, non-technical language.

* Tell them to assume the presentation will be given to people with little or no formal schooling.

* Explain that the materials which have been gathered are all available for use in the presentations or they can find and use other materials.

* Encourage the groups to use non-formal education techniques such as skits, visual aids, songs, dances, etc.

* Circulate among the groups and offer assistance where necessary.

Step 4. (45 minutes)
Have the groups give their demonstrations.

Trainer Notes

Discuss each demonstration after it is given. These questions will help to focus the discussion:

* What worked well during the demonstration?

* What didn't work well?

* Would the demonstration be understandable by people with little or no formal schooling?

* What could have been done differently to improve the demonstration?

Step 5. (15 minutes)
Discuss how types of heat transfer are applied to solar devices.

Trainer Notes

To stimulate the discussion, ask the following question:

How will these three types of heat transfer work for and against you in your solar devices?

Step 8. (5 minutes)
Have the participants clean up the area.

THE ROLE OF THE VOLUNTEER IN DEVELOPMENT: INTERNATIONAL DEVELOPMENT

PART 1: THE GREEN REVOLUTION: SUCCESSES AND FAILURES

Total time: 2 hours

Trainer Notes

"The Green Revolution: Successes and Failures" is a two-part activity. (Part 1 is Phase III: Session 17 and Part 2 is Phase IV: Session 1.) Part 1 introduces participants to issues and resource materials related to the transfer of technology in developing countries. In Part 2, participants debate the effectiveness of various methods of technology transfer.

The two sessions should be held on two successive days to allow sufficient time for preparation.

Objective: To identify and discuss issues involved in the transfer and development of technology

Resources:

- Lappé and Collins, Food First, pp. 121-177
- Rodale, Organic Gardening and Farming, "The Greening of the Green Revolution," pp. 23(7): 34-40
- Int. Institute of Tropical Agriculture, "Sowing the Green Revolution"
- Brush, Natural History, "Farming the Edge of the Andes," pp. 86(5) 32+
- Franke, Natural History, "Miracle Seeds and Shattered Dreams in Java," pp. 83(4) 10-12
- Gussow, The Feeding Web, pp. 395 - 399

Trainer Notes

- The resources cited above provide contrasting perspectives on issues relating to technology transfer.
- Other, more current, or area-specific resources can be used. If you decide to use other resources, it is important that they provide participants with contrasting or contrary views regarding the effectiveness of the Green Revolution as a development strategy.
- Before the session, make enough copies of the resources for all of the participants.

Step 1. (10 minutes)
Explain the objectives of the session by giving a short talk on past and present patterns of technology transfer and development in international development.

Trainer Notes

A suggested resource for developing this orientation is:

Warpeha, Paul, Perceptions of Technology: A Study of the Human Project, NTIS, Washington, D.C., 1979, Introduction.

Step 2. (10 minutes)
Review and explain the session procedures.

Step 3. (30 minutes)
Distribute the reading materials and allow the participants time to review them.

Step 4. (20 minutes)
Have the participants join one of three groups, explaining that in the up-coming debate:
Group #1 will take a position supporting the Green Revolution.
Group #2 will oppose the Green Revolution.
Group #3 will present possible alternative strategies for agricultural development programs.

Trainer Notes

As the participants select their groups, list their names on posted newsprint.

Step 5. (20 minutes)
Explain the debate procedures as outlined in Phase IV: Session I.

Trainer Notes

In order to follow debate procedure, it will be necessary for someone to serve as moderator with the responsibility of keeping time and maintaining the flow. If one of the participants has had debate experience, he/she should be asked to serve as moderator.

Brief the moderator thoroughly regarding the importance of following the debate procedures. Ask him/her to explain the basic groundrules for debate to the other participants.

Step 6. (30 minutes)
Explain that the groups should use this time to develop their debate strategies.

PRESENTATION OF PEDAL/TREADLE-POWERED DEVICES

Total time: 4 hours

Objectives:

- To present the pedal/treadle-powered devices using non-formal education techniques
- To discuss and evaluate the devices constructed during the phase
- To evaluate how the training went during the phase

Materials: Completed pedal/treadle-powered devices; other materials as determined by the participants

Procedures: Step 1. (5 minutes)
Present the session objectives and activities.

Step 2. (1 hour, 30 minutes)
Have the construction groups give their presentations.

Trainer Notes

At the end of each presentation, have the participants discuss what they felt was clear about the presentation, what wasn't clear and give any suggestions they might have for improving the presentation.

Step 3. (1 hour)
Have the participants discuss and evaluate each of the groups.

Trainer Notes

Guide the discussions to cover the following questions:

- What works best about the device?
- What is the weakest part of the device?
- Is it easy to use? Who can use it? Who cannot?
- Is it easy to maintain and repair?
- Did the design change during construction?

Step 4. (30 minutes).
Have the participants discuss and evaluate the pedal/treadle portion of Phase III.

Trainer Notes

Use the following questions as guidelines for the discussion:

- What was learned?
- Were expectations met?
- How could the phase be improved?
- How could the trainer have been more effective?

Step 5. (55 minutes)
Have the participants remove the devices and clean up the work area.

VOLUNTEERS IN DEVELOPMENT
PART ONE: WOMEN IN DEVELOPMENT

Total time: 2 hours

Objectives:

- To identify and discuss some of the issues of women in development (WID)
- To begin to clarify views, expectations and assumptions about women in developing countries

Resource: Tinker, "The Adverse Impact of Development on Women," in Women and World Development, pp. 1-9

Materials: Newsprint and felt-tip pens, props for the skits, i.e., cloth for clothing, hats, baskets, bowls.

Trainer Notes

This session will require some preparation. You will need copies of the Tinker article. It should be distributed ahead of time to allow participants an opportunity to read it before the session. Also, gather a selection of items that can be used as props for the skits (see Materials).

Procedures:

Step 1. (5 minutes)
Post the objectives and outline the session activities.

Step 2. (10 minutes)
Refer to the Tinker article and have the participants identify some of the major topics concerning women in development. Facilitate questions and comments about the issues involved in each topic.

Trainer Notes

- Mention the following women in development topics: urbanization, the introduction of new technology, education, the change in women's roles, and the growth of a cash economy.
- Record the topics on newsprint for use in the next WID session (Phase IV: Session 12).

Step 3. (30 minutes)
Have the participants form small groups and develop a 10-minute skit using one of the topics from the list as a theme.

Trainer Notes

Call their attention to the props and mention that they can use them in the skits.

Step 4. (60 minutes)
Have the group reconvene and present the skits.

Trainer Notes

This session was originally planned for six groups. If there are too few participants to form six groups, you may wish to extend the length of preparation time (Step 4) for each of the groups, or allow for a longer discussion (Step 5) or both.

Step 5. (20 minutes)
Discuss any general impressions created by the skits.

Trainer Notes

* During the discussion, have the participants identify issues that were brought out in the skits. Ask them how they might try to deal with these issues during their Peace Corps service.

* Conclude by briefly mentioning Part Two of Women in Development (Phase IV: Session 12).

MID-PROGRAM EVALUATION
PART ONE: PROGRAM EVALUATION

Total time: Approximately 4 hours
The total time may vary according to the number of participants and options exercised.

Objective: To evaluate the effectiveness of the program to date in meeting goals and expectations.

Resources:

- Attachment III-20/1-A, "Mid-Cycle and Final Evaluation of Training Goals"
- Attachment III-20/1-B, "Discussion Questions"
- "Expectation Lists," prepared in Phase I: Session 2

Materials: Newsprint and felt-tip pens

Procedures: Step 1. (10 minutes)
Present an overview of the entire session (Parts One and Two) and have participants select one of the indicated options (see Step 6).

Step 2. (20 minutes)
Distribute Attachment III-20/1-A, "Mid-Cycle and Final Evaluation of Training Goals," and ask participants to complete it.

Step 3. (5 minutes)
Distribute the "Expectations List" from Phase I and Attachment III-20/1-B, "Discussion Questions."

Step 4. (30 minutes)
Have participants form groups of up to five, and:

- Review and discuss the overall program in relation to the discussion questions.
- List on newsprint 4-5 ways in which their expectations have been met and 4-5 ways in which they have not been met.

Step 5. (5 minutes)
Ask each group to return and post their lists at the front of the room.

Step 6. (40 to 60 minutes)
Option A: Have a representative from each group explain and discuss their list.
Option B: Use the lists as a basis for moving into the "Fishbowl" activity described in Phase I: Session 16, Part Three.

MID-CYCLE AND FINAL EVALUATION OF TRAINING GOALS

Rate the effectiveness of the training program in achieving the following goals. Give 2 or 3 specific examples in support of your rating.

	Not very Effective		Adequate		Extremely Effective
1. Assess and analyze community felt needs	1	2	3	4	5
2. Assist others in the design, adaptation, construction, utilization and maintenance of simple technologies	1	2	3	4	5
3. Acquire and apply skills and attitudes that promote the improvement of the quality of life through local initiative, community problem solving	1	2	3	4	5
4. Examine and understand the cultural and societal values that accompany all overseas development workers	1	2	3	4	5
5. Develop and practice effective experiential learning and teaching processes	1	2	3	4	5
6. Understand the synergistic relationship between health and technology and the inter-related nature of all aspects of culture	1	2	3	4	5
7. Encourage and include the active, full participation of all community members in programs of change	1	2	3	4	5
8. Maintain personal well-being and the attitudes conducive to effective and appropriate overseas service	1	2	3	4	5

DISCUSSION QUESTIONS

1. Has the program met expectations?

2. Is the program providing adequate skills training?

3. Is the technical level too high or too low?

4. Could the program be better adapted to suit individual needs?

MID-PROGRAM EVALUATION
PART TWO: ASSESSMENT OF GROUP DYNAMICS

Total time:	See Part One
Objective:	To evaluate the dynamics of the group within the context of the training program
Resources:	Attachment III-20/2, "Coat of Arms"
Materials:	List of questions on newsprint (see Step 2)
Procedures:	Step 1. (10 minutes) Review the session objective and procedures. Distribute Attachment III-20/2, "Coat of Arms."

Trainer Notes

Explain that the object of this exercise is to draw a symbolic "Coat of Arms" which represents perceptions of the dynamics of the group within the context of the training program.

Step 2. (10 minutes)
Post and explain the list of questions for the coat of arms.

Trainer Notes

Explain that the participants will draw a symbol in the corresponding spaces on the coat of arms that answers the following questions:

1. What has been our major failure as a group?
2. What has been our major accomplishment as a group?
3. To what extent do our interactions here in training reflect the kinds of interactions we will encounter as Peace Corps Volunteers?
4. What is our major unresolved conflict or problem as a group?
5. What can we do to resolve this conflict or problem?
6. What can we do to improve our interaction skills in general?

Step 3. (20 minutes)
Referring to the posted list, read each question in order, allowing time for people to draw their symbols before moving to the next question.

Trainer Notes

Draw your own coat of arms while the group does theirs.

Step 4. (5 minutes)
After everyone has finished drawing his/her coat of arms, share your coat of arms by explaining the meaning of each of your six drawings.

Step 5. (60 to 60 minutes)
Have each participant explain the meaning of his/her coat of arms.

Trainer Notes

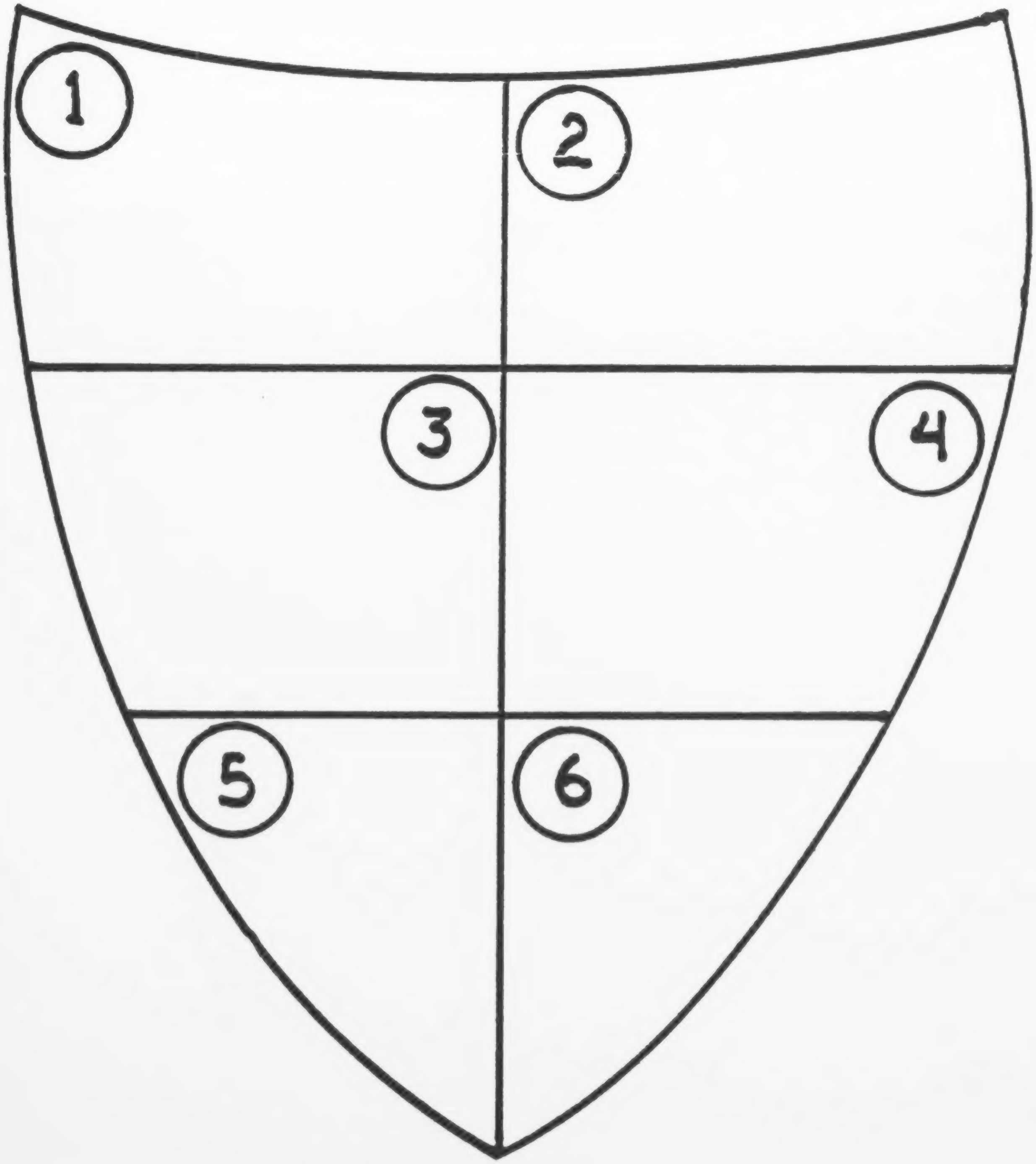
If the group is large (15 or more participants), time limitations may require dividing the group into two or three small groups for this step.

Step 6. (15 minutes)
Conclude the session by having participants summarize the results of the activity, highlighting problems and possible solutions.

Trainer Notes

Time remaining from the scheduled four-hour period can be utilized by moving into the regularly scheduled "Phase Evaluation Questionnaires" or counterpart sessions.

COAT OF ARMS



PHASE IV: SOLAR WATER HEATERS

Health and Nutrition

The Role of the Volunteer in Development

	DAY 1	DAY 2	DAY 3
A.M.	SESSION 1: Role of the Volunteer in Development, Part 2: The Green Revolution (Skill Areas II&III) SESSION 2: Introduction to Solar Water Heaters (I)	SESSION 4: Introduction to Solar Water Heating: Determining Hot Water Demand (I & III) Independent Study	SESSION 7: Demonstration of a Technical Concept (II) SESSION 8: Shade Mapping and Solar Siting (III)
P.M.	SESSION 3: Assessing Community Water Needs and Uses (I)	SESSION 5: Plumbing a Solar Water Heater (III) SESSION 6: Sizing a Solar Water Heater (III)	SESSION 9: Design of Solar Water Heaters (III)

	DAY 4	DAY 5	DAY 6
A.M.	SESSION 10: Construction of Solar Water Heaters (III & IV)	SESSION 11: Multi-Media Standard First Aid (I)	Construction (continued)
P.M.	Construction (continued)		

	DAY 7	DAY 8	DAY 9
A.M.	Construction (continued)	Independent Study SESSION 12: Wind Technology (III)	SESSION 15: Presentation of Solar Water Heaters (V)
P.M.	Construction (continued)	SESSION 13: Volunteer in Development: Part 2, Women in Development (I & III) SESSION 14: House Design in Four Climates (III)	

THE ROLE OF THE VOLUNTEER IN DEVELOPMENT: INTERNATIONAL DEVELOPMENT

PART 2: THE GREEN REVOLUTION: SUCCESSES AND FAILURES

Total time: 2 hours

Trainer Notes

For session objectives, resources and materials, refer to Part 1 of Phase III: Session 17.

Procedures: Step 1. (15 minutes)
Have the moderator review the debate procedures and explain the basic ground rules for a debate.

Trainer Notes

The procedures for the debate are as follows:

A. (2-1/2 minutes) Group #1 makes a brief statement of its position.
B. (2-1/2 minutes) Group #2 makes a brief statement of its position.
C. (10 minutes) Group #1 expands its position by stating facts and providing supporting evidence.
D. (10 minutes) Group #2 expands its position by stating facts and providing supporting evidence.
E. (10 minutes) Group #1 directs questions to specified members of Group #2.
F. (10 minutes) Group #2 directs questions to specified members of Group #1.
G. (10 minutes) There is open questioning.
H. (5 minutes) Group #1 delivers final summation of its position.
I. (5 minutes) Group #2 delivers final summation of its position.
J. (15 minutes) Group #3 presents its ideas on steps that could be taken to develop strategies which would best address the needs of developing countries.

Step 2. (80 minutes)
Have the moderator carry out the debate procedures.

Step 3. (25 minutes)
Summarize the session and facilitate a discussion by asking participants if any of their ideas about appropriate strategies for technology transfer were changed or influenced by the debate.

INTRODUCTION TO SOLAR WATER HEATERS

Total time: 2 hours

Objectives:

* To review and discuss various types of solar water heaters

* To explain the basic principles of solar water heating

* To discuss examples of solar water heaters being used throughout the world, especially in developing countries

Resources:

* Zweig, Peter, "Introduction to Solar Water Heaters" Slide Show

* Attachment IV-2-A, "Sunlight and Glazings"

* Attachment IV-2-B, "Typical Thermosiphon Solar Water Heater"

* Attachment IV-2-C, "Lesotho Solar Water Heaters"

* Attachment IV-2-D, "Early Solar Water Heaters"

Materials: Newsprint and felt-tip pens, slide projector, screen

Procedures: Step 1. (5 minutes)
Review session objectives and outline the activities.

Step 2. (45 minutes)
Distribute and briefly review the attachments (See Resources). Encourage a discussion of the application of solar water heaters in developing countries.

Trainer Notes

Begin the discussion by asking such questions as:

* Why solar? Or, why use solar energy?

* Why is solar energy considered a "second-rate" energy source in some countries?

Continued

Trainer Notes/Continued

- What factors have kept solar energy from being an "appropriate" technology?

- What factors have contributed to its "appropriateness"?

It is more useful to facilitate a discussion of each attachment than to describe each one to the participants. Encourage people to explain the sketches and drawings. If the explanation is incorrect or incomplete, ask for other interpretations as you guide the discussion and help the participants understand the material. Keep the discussion focused and do not spend too much time on any one attachment.

Take the time, however, to make sure that all participants understand the information, since it will be needed during the slide presentation and throughout the phase. Note that some systems shown are plumbed to sinks or showers while others must be filled and emptied daily.

Be sure that the discussion addresses such issues as --

- Plumbed and unplumbed solar water heaters
- Simple solar water heaters vs. large and/or expensive systems
- The needs and uses of hot water
- The participants' own use of hot water
- How that need may change once in the host country

Explain that there are some communities in the world where hot water is not found. No one has ever had hot water there and everything is and always has been done with cold water.

Ask the participants:

- What important information should be obtained before attempting to introduce solar water heaters to a community?

- How could solar water heaters be effectively introduced to a community that has traditionally used only cold water?

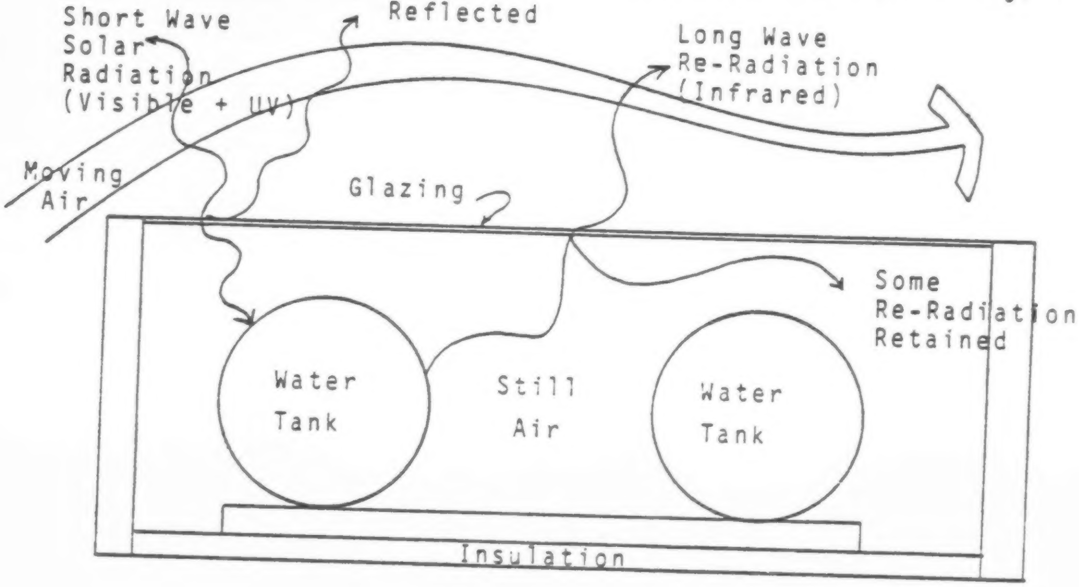
Step 3. (60 minutes)
Present the slide show on solar water heaters, encouraging discussion and questions.

Trainer Notes

Again, as with the session attachments, ask the participants to describe each slide as it is projected. Do not spend too much time on any one slide. Refer to the attachments as necessary. Focus the discussion on the possible utility of the different models in developing countries, how the devices function, what they are made of, their cost, etc.

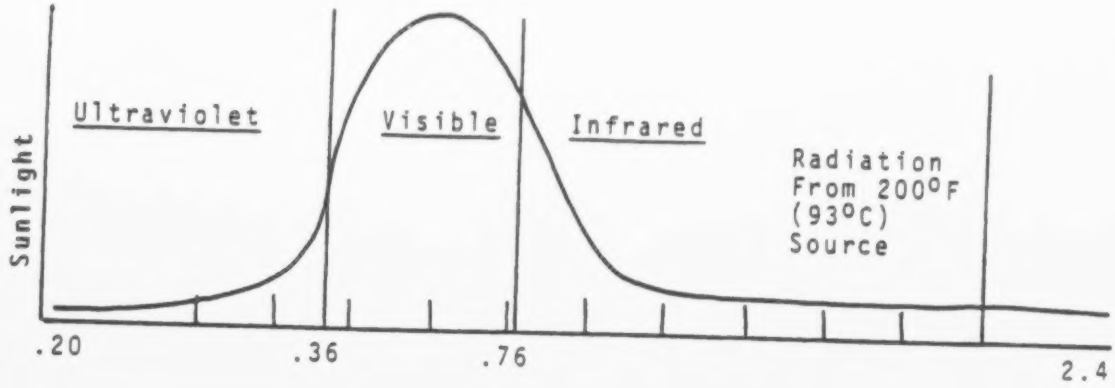
Step 4. (10 minutes)
Conclude the session by asking the participants to identify what they feel are important points to keep in mind when considering the application of solar water heaters in the countries in which they will be serving.

SUNLIGHT AND GLAZINGS

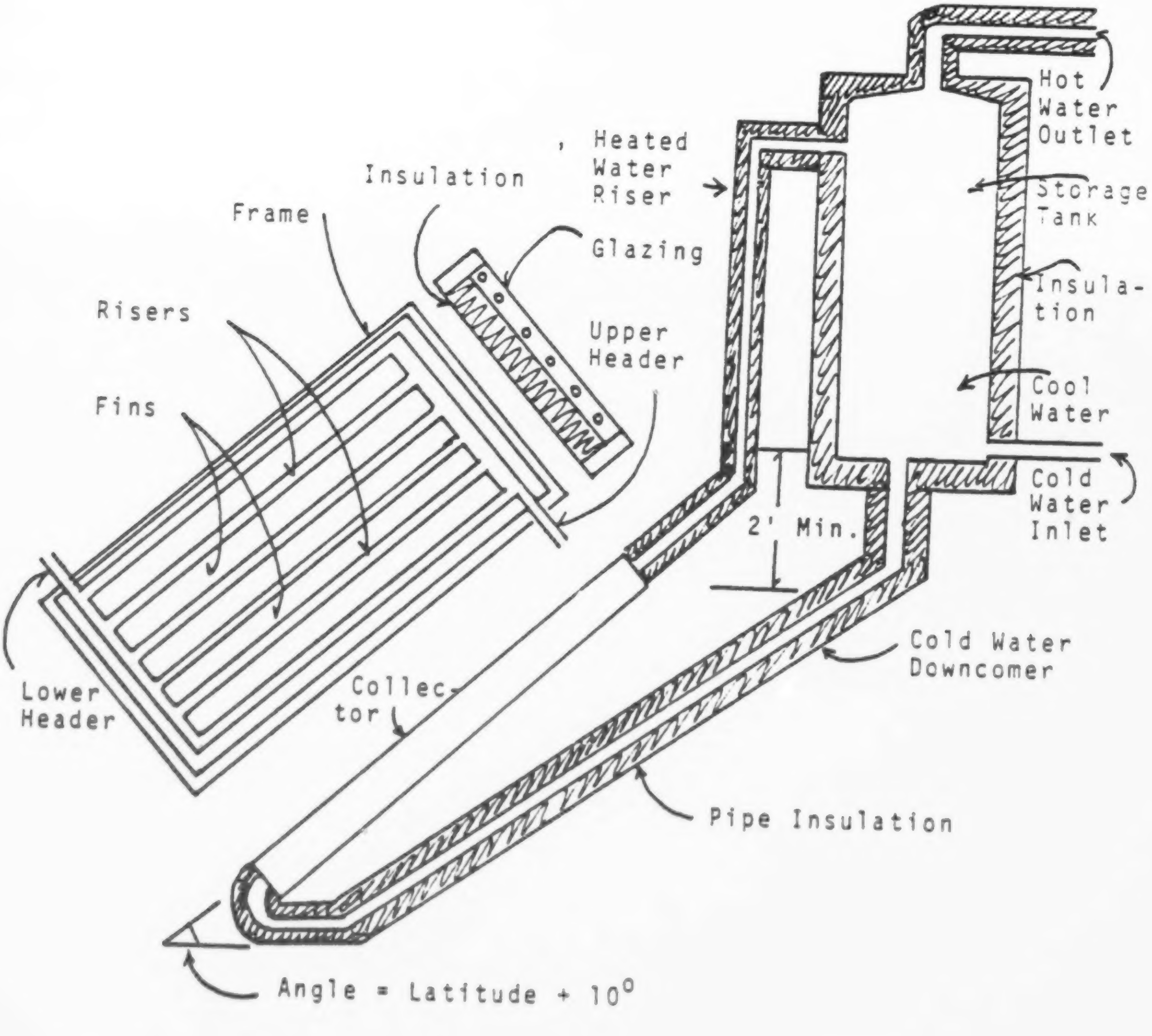

Short Wave
Solar
Radiation
(Visible + UV)
Reflected
Long Wave
Re-Radiation
(Infrared)
Moving
Air
Glazing
Some
Re-Radiation
Retained
Water
Tank
Still
Air
Water
Tank
Insulation

Glazing Material	Short Wave-Length Transmis-sivity	Long Wave-Length Transmis-sivity
Polyethylene	85-95%	85%
Polyvinyl	85-95%	70%
Fiberglass	72-93%	10%
Glass	88-93%	3%

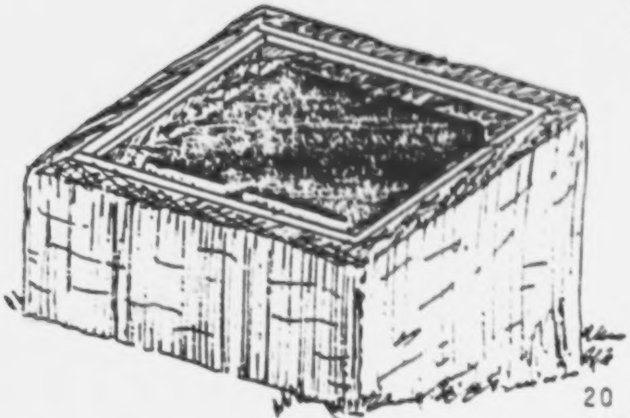
Radiation Wavelength (Micrometers):



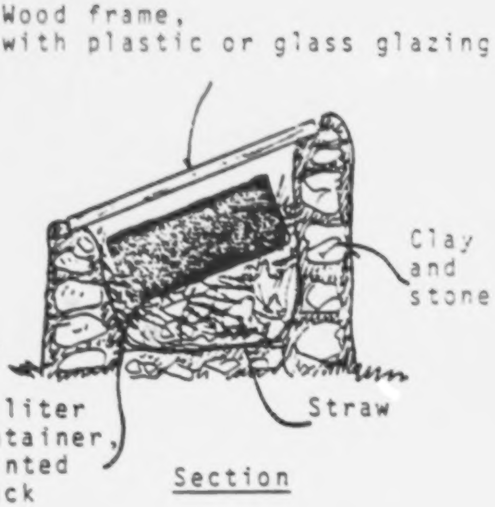
TYPICAL THERMOSIPHON SOLAR WATER HEATER


Hot Water Outlet
Heated Water Riser
Insulation
Frame
Glazing
Storage Tank
Risers
Insulation
Upper Header
Fins
Cool Water
Cold Water Inlet
2' Min.
Cold Water Downcomer
Lower Header
Collector
Pipe Insulation
Angle = Latitude + 10°

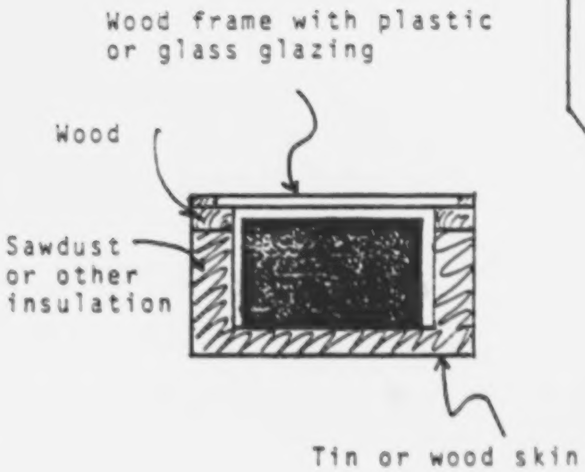
LESOTHO SOLAR WATER HEATERS



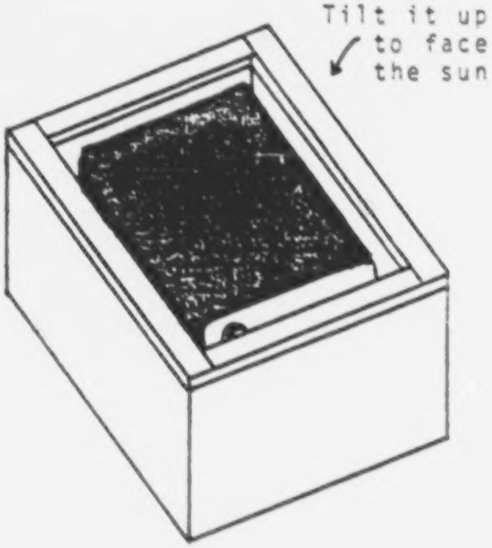
Perspective


Wood frame,
with plastic or glass glazing
Clay
and
stone
20 liter
container,
painted
black
Straw

Section

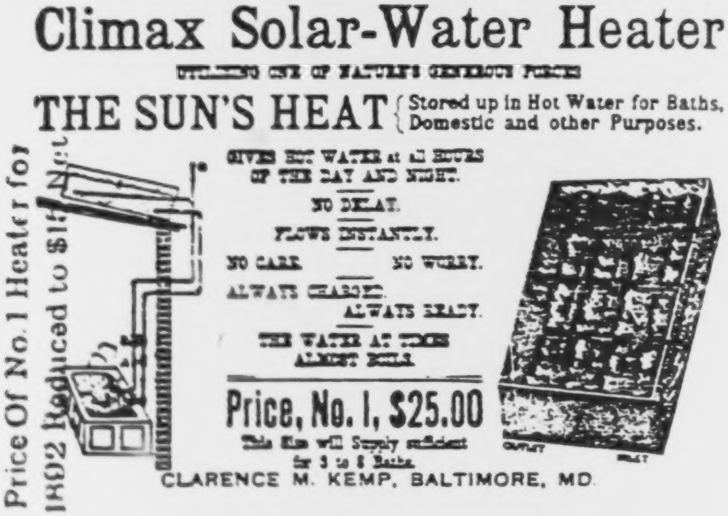

Wood frame with plastic
or glass glazing
Wood
Sawdust
or other
insulation
Tin or wood skin

Section


Tilt it up
to face
the sun

Perspective

EARLY SOLAR WATER HEATERS



Climax Solar-Water Heater

UTILIZING ONE OF NATURE'S GENEROUS FORCES

THE SUN'S HEAT { Stored up in Hot Water for Baths, Domestic and other Purposes.

GIVES HOT WATER at all HOURS OF THE DAY AND NIGHT.

NO DELAY.

FLOWS INSTANTLY.

NO CARE. NO WORRY.

ALWAYS CHARGED. ALWAYS READY.

THE WATER AT TIMES ALMOST BOILS.

Price, No. 1, $25.00

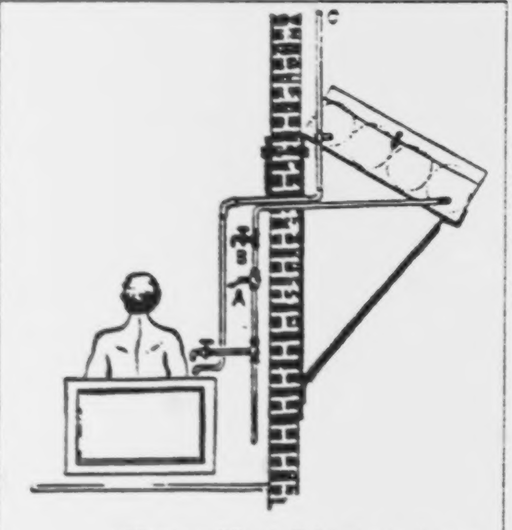
This Size will Supply sufficient for 3 to 8 Baths.

CLARENCE M. KEMP, BALTIMORE, MD.

Price Of No. 1 Heater for 1892 Reduced to $15 Net

Advertisement for the Climax solar water heater, 1892. The price of this, Kemp's smallest unit, had just dropped from $25 to $15.

Below: Two ways to install the Climax, from a company brochure: pressurized system (left), and gravity-fed system (right).

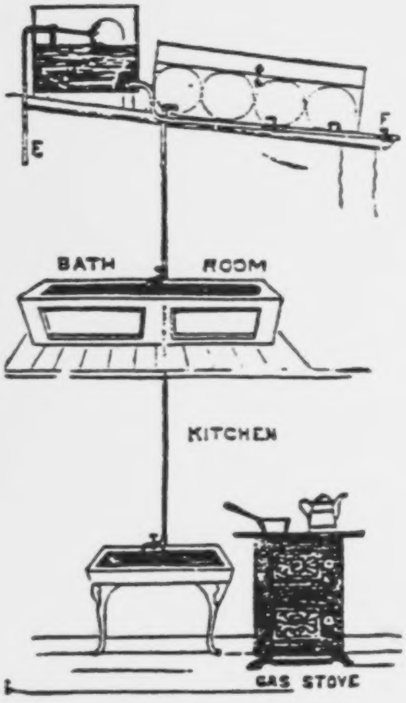


—Shows a Climax Solar-Water Heater supported by a bracket on the wall.

A.—Is the cock to use when the hot water is wanted. This passes cold water into the heater, displacing the hot water and forcing it through a pipe to the bath tub.

B.—Is the drain cock which is used to prevent freezing.

C.—The air opening which prevents vacuum in the heater and siphonic action.



ASSESSING COMMUNITY WATER NEEDS AND USES

Total time: 4 hours

Objectives:

* To develop and use a community water needs assessment form in the evaluation of local water use and requirements

* To discuss the importance of sensitivity to community organization, culture, customs and values

Resources:

* Attachment IV-3-A: "Guidelines for Community Water Needs:

* "Skills for Development Facilitators" from Manual Introduction

Procedures:

Step 1. (10 minutes)
Give an overview of the session and distribute Attachment IV-3-A: "Guidelines for Community Water Assessment Needs."

Step 2. (30 minutes)
Have participants form work groups. Then read and discuss the attachment. Each group should develop a plan to assess the water needs in a local community.

Step 3. (2 hours)
Each group follows the plans they have developed to assess community water needs and uses. Ask them to prepare a brief report of findings and methods.

Step 4. (1 hour)
The groups meet and present their reports.

Trainer Notes

To stimulate discussion, these questions might be raised:

* Why type of assessment was used?

* Why was it selected?

* Was the method effective? How could you tell?

* Were community members receptive?

* What was it like to be in the role of interviewer?

Continued

Trainer Notes/Continued

- How did you know if the sources were reliable?
- Were there any specific customs and/or values which seemed to facilitate/impede the information gathering process?

Step 5. (20 minutes)
Ask participants to review the skills for development facilitators (from the manual introduction) and discuss any correlation between the five skill areas and the procedures involved in this session.

Trainer Notes

You may find it helpful to focus the discussion by emphasizing similarities and/or differences in the sequential order of the skill areas and the procedures of this session.

GUIDELINES FOR COMMUNITY WATER NEEDS/USES ASSESSMENT

In teams of 2 to 4 people, choose an aspect of community life (education, health care, residential, support systems, etc.) and through community assessment techniques (questionnaire, interview, observation, conversation, combinations of a number of methods), gather data about the water requirements and uses in that particular area. The data should include:

- End use of the water
- Amounts and temperatures required at the end use
- Disposal systems for gray and black water (including who is responsible, the specific methods of disposal)
- Description of the water system
- Water sources and methods of storage
- Purification systems
- Health problems associated with the water system

In gathering the information, please follow these guidelines:

- All team members should participate actively in all phases of the exercise.

- Information gathering should be conducted in a sensitive and careful manner.(Always ask permission before entering a place or reading a meter. Be sure you don't prowl around or intrude.)

- Concentrate on using appropriate communication skills: respect your informants' privacy and values, listen and report accurately, be patient, report facts, not what you wish you had found.

- Limit the scope of the report -- or you may be overwhelmed.

Your written report should include:

- A summary of data
- A copy of questions asked
- Methodology used
- Resources consulted during the project
- Suggestions for improving the assessment
- Recommendations to improve existing water systems and health status in ways that are environmentally sound, energy efficient, and within cultural and economic constraints of the community

INTRODUCTION TO SOLAR WATER HEATING: DETERMINING HOT WATER DEMAND

Total time: 2 hours

Objectives:

* To collect and calculate data regarding estimated levels of daily hot water use.

* To compare different levels of hot water use in the United States to probable hot water consumption and needs in host countries

* To discuss the possible uses of solar-heated water in host countries

Resources:

* Attachment IV-4-A, "Hot Water Volume and Temperature Data Collection Sheet"

* Design Criteria list from Session 2

Materials: Hot water source and for each group: 1 liter calibrated metric containers, large (8 liter or 2 gallon) wash basins, Celsius thermometers, newsprint and felt-tip pens

Trainer Notes

You may want to select one or two participants to assist as co-facilitators for this session. If so, review the session procedures with them and plan their involvement. Their involvement might include: gathering and distributing materials, facilitation of discussions and assisting the other participants with calculations. If this option is followed, set aside time after the session for feedback on their facilitation skills.

Procedures: Step 1. (10 minutes)
Post the session objectives and briefly outline the activities.

Step 2. (10 minutes)
Have participants review the list of design criteria for solar hot water devices developed during Session 2.

Trainer Notes

Try to generate new ideas for additions or modifications to the list.

It is important that the criteria list include: inlet temperature, insolation rate, percent possible sunshine and efficiencies and volumes.

Step 3. (5 minutes)
Note the criteria that are related to water temperature, volume, use and the kind of consumer and explain that the session's activities will focus on these areas.

Step 4. (5 minutes)
List three categories of consumers: heavy, light and low (or non-users).

Trainer Notes

Ask for examples in each category:
* Heavy: industrial use, convenience-oriented urban family
* Light: conservation-minded family, etc.
* Low: poor rural family, backpacking, etc.
Point out that there will be overlap in each category.

Step 5. (5 minutes)
Distribute Attachment IV-4-A, "Hot Water Volume Temperature Data Collection Sheet." Explain the data collection activity and have participants form work groups of 2 or 3.

Trainer Notes

* Explain that each work group will select a consumer type from one of the categories listed and collect data on the estimated amount of hot water used per day by the hypothetical user.

* Data should be collected in at least three areas (e.g., handwashing, dishwashing, bathing, etc.). Post the instructions to help clarify the activity.

* Questions about the data collection procedure will probably arise (e.g., "Do we have to take a shower and collect the water?"). Explain that where possible, people should collect the water as it is used. If it is not feasible, as in the case of a shower, an estimate of the water needed should be made.

* Be sure there is no confusion on how to fill out the data collection sheet.

* At this point, a co-facilitator/s may assist work groups who need clarification.

Step 6. (45 minutes)
Have work groups collect and calculate data.

Step 7. (10 minutes)
Reconvene the large group and have a representative from each work group report their findings and discuss methods used to obtain the data.

Step 8. (20 minutes)
Facilitate a discussion of water use customs and patterns in host countries as compared with the United States.

Trainer Notes

For reference during this discussion, post the following information about average consumption of hot water in the U. S.:

* Heavy consumer: 60 - 80 liters per day
* Light or conserving consumer: 30 - 50 liters per day
* Host country person: 0 - 80 liters per day

You should provide further focus for this discussion by asking and/or posting on newsprint the following questions:

* How do water consumption rates and patterns in host countries compare with those of the U. S.?

* In rural villages in which there has never been hot water, will there be a need or desire for hot water?

* What are some specific, potential uses for solar water heating devices in host countries?

Step 9. (10 minutes)
Explain that the information presented and ideas generated during this session will be used in conjunction with the data on insolation and climate to develop a sizing formula for use in the design of solar devices.

Explain that the information and ideas will also apply to the selection and design of solar-heated devices during this training program.

HOT WATER VOLUME AND TEMPERATURE DATA COLLECTION SHEET

Step 1:
Fill out the following chart for one person's daily hot water use, recording the actual volume and temperature data where you can and estimating where you need to do so. Decide among the group whether your measurements and estimates are for a non-conserving person, a conserving person, a city-dweller, a rural person, a camper, etc.

Hot Water Use	Volume Per Day $\left(\frac{\text{Liters}}{\text{Day}}\right)$			Temperature (°C)		
	Min.	Max.	Avg.	Min.	Max.	Avg.
Hands						
Dish wash & rinse						
Sponge bath						
Shower						
Clothes wash & rinse						
Other						
Other						
TOTAL AVERAGE VOLUME PER PERSON PER DAY				MAX. TEMP:		

Step 2:
Decide how many people are in your hypothetical family of conservers, non-conservers, campers, etc. Multiply the total average volume per person per day times the number of people in the family to find out the average daily family hot water usage (given in liters per day):

Total average volume per person per day ( ) Liters/Person Day

X Number of people in the family x(___) Persons

= Average daily family hot water use ( ) Liters/Day

NOTE: This information will be used in Session 6: Sizing a Solar Water Heater

PLUMBING A SOLAR WATER HEATER

Total time: 2 hours

Objectives:

* To identify plumbing fittings and their uses
* To identify plumbing tools such as pipe wrenches, pipe vise, cutter and threaders
* To demonstrate the mechanisms for galvanized pipe cutting and threading
* To cement PVC (poly vinyl chloride) pipe and fittings together such that no leaks occur
* To diagram a plumbing schematic of a solar water heater

Resources:

* Attachment IV-5-A, "Plumbing Fitting Nomenclature"
* Attachment IV-5-B, "Plumbing Schematics Worksheet"
* Attachment IV-5-C, "Plumbing Solar Water Heaters"
* Bainbridge, The Integral Passive Solar Water Heater Book
* Anderson, The Solar Home Book, pp. 209-226
* VITA, Village Technology Handbook, pp. 86-91
* Burton, "Integral Passive Solar Water Heater Plans"

Materials: A variety of plumbing fittings (nipples, elbows, tees, 45's, couplings, unions, lock nuts, adapters, etc.) in 12 and 18 mm (1/2" and 3/4") galvanized iron, and PVC pipes, gate and globe valves, hose clamps, pipe vise, pipe wrenches, pipe cutter, pipe reamer, pipe threader, threading oil, threading compound, PVC solvent, PVC primer

Procedures: Step 1. (5 minutes)
Present the session objectives and outline the activities.

Step 2. (20 minutes)
Distribute Attachment IV-5-A, "Plumbing Fitting Nomenclature," Spread the assortment of galvanized and PVC plumbing fittings on a large table and have the participants identify and discuss the use of each fitting.

Trainer Notes

Allow a few minutes for small groups to assemble five to ten fittings with the understanding that each small group will then name each fitting in the assembly, from end to end, with help from the group as needed. Or, hold up each fitting, piece by piece, and ask the group to name it.

Explain that it is important during training to know plumbing terminology or nomenclature in order to:

* Complete the plumbing schematic worksheet (See Step 6)

* Complete the solar water heater plumbing schematic and parts list to be developed during the design session

* Be more clear during construction when one member of the small construction group is sent to get a "1/2" whatchamacallit" from the shop

* Better understand any new names for fittings which may exist in the participant's country of assignment

Be certain that this step includes a discussion of how and when a pipe union should be used.

Step 3. (15 minutes)
Demonstrate and describe the cutting, reaming and threading of galvanized pipe using the appropriate tools.

Trainer Notes

You may choose to ask for volunteers with plumbing experience to demonstrate to the rest of the group how galvanized pipe is cut, reamed and threaded. Be certain that the volunteer is complete in his/her description. Include proper tool use instructions as needed, especially with the cutter, the pipe vise, pipe wrenches, reamer and pipe oil.

Step 4. (10 minutes)
Demonstrate and describe the joining of galvanized pipe using pipe wrenches and pipe joint compound.

Trainer Notes

Again, ask for volunteers from the group to demonstrate.

Mention the different pipe joint compounds used throughout the world, including oil, oiled rope or twine (China), lead rope, teflon rope, etc.

Continued

Trainer Notes/Continued

Describe the use of pipe wrenches (i.e., two are needed at one time, how they automatically ratchet, the proper way to hold, adjust, and use a pipe wrench, etc.).

Explain that pipe joint compound is placed only on the male threads of the pipe joint so that the compound is evenly spread over the threads as the fitting is tightened.

Step 5. (15 minutes)
Demonstrate and describe the joining of PVC pipe and fittings, using primer and/or solvent.

Trainer Notes

Ask for volunteers from the group to demonstrate this step.

Point out that:

* Solvent is placed on the male part only for small size pipe (12 and 18 mm) but for large pipe it is O.K. to use solvent on both ends. If solvent is used on the female end, it may form a bubble and seal off the smaller sized pipes as the two pieces are pressed together. With large pipe, this is less likely to happen.

* The two pieces need to be twisted together and held still for a few seconds to keep them together.

* PVC fittings are not re-usable.

Describe the process that the solvent goes through to "melt" a thin layer of pipe and fitting together to form the seal.

Discuss the usefulness of PVC pipe in solar water heaters, since it cannot take very high temperatures and it doesn't transfer heat well.

Step 6. (20 minutes)
Distribute Attachments IV-5-B and IV-5-C and have the participants complete the plumbing schematic of the solar water heater shown in Attachment IV-5-B.

Trainer Notes

Allow the participants to work individually or in groups of two to complete the schematic. Explain that the answers are partially described in Attachment IV-5-C. Remind them to label all parts, including pipe size,type, fittings, valves, etc. Remind them of the use of unions in plumbing.

Step 7. (20 minutes)
Have each individual or small group describe and explain their plumbing schematic to the group.

Trainer Notes

Be sure the criteria on the worksheet are addressed by each presentation.

After the first or second description, ask for any new or different schematics.

At the end of the presentations, briefly identify and discuss inexpensive and effective plumbing shortcuts:

* Explain how a tee-with-a-plug can replace a more expensive drain valve at the bottom of each tank.

* Ask how a mixing valve could be manufactured from scratch, using only one union (one tee, two valves and some nipples).

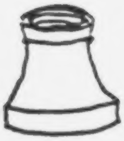
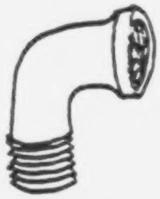
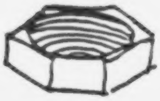
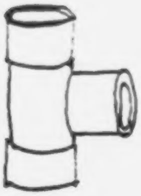
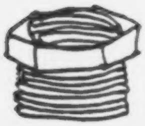
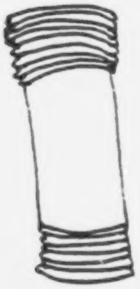
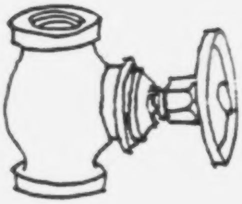
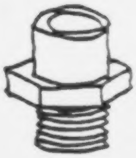
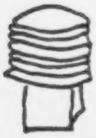
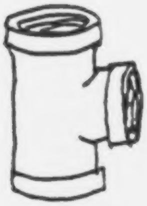
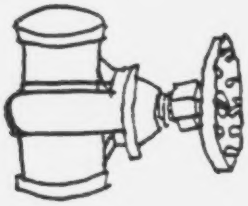
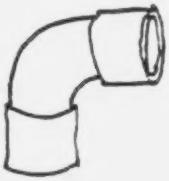
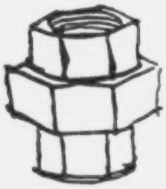
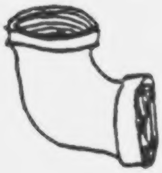
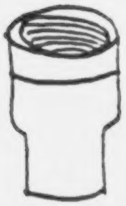
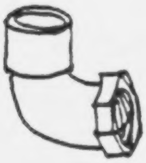
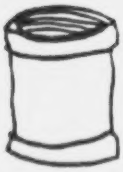
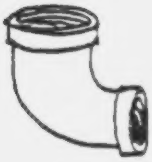
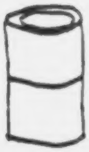
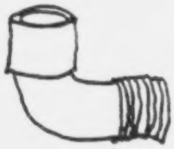
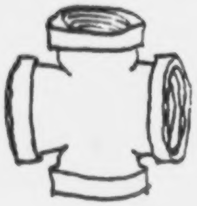
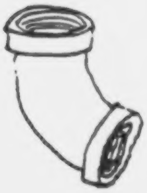
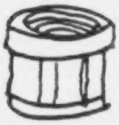
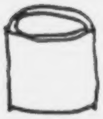
Step 8. (15 minutes)
Conclude the session with a brief discussion of plumbed vs. unplumbed solar water heaters, their advantages and disadvantages, and their applications in countries in which participants will be serving.

Trainer Notes

Allow time at the end of the session for cleanup and dismantling of any plumbing that was constructed during the session.

ATTACHMENT IV-5-A- Page 1

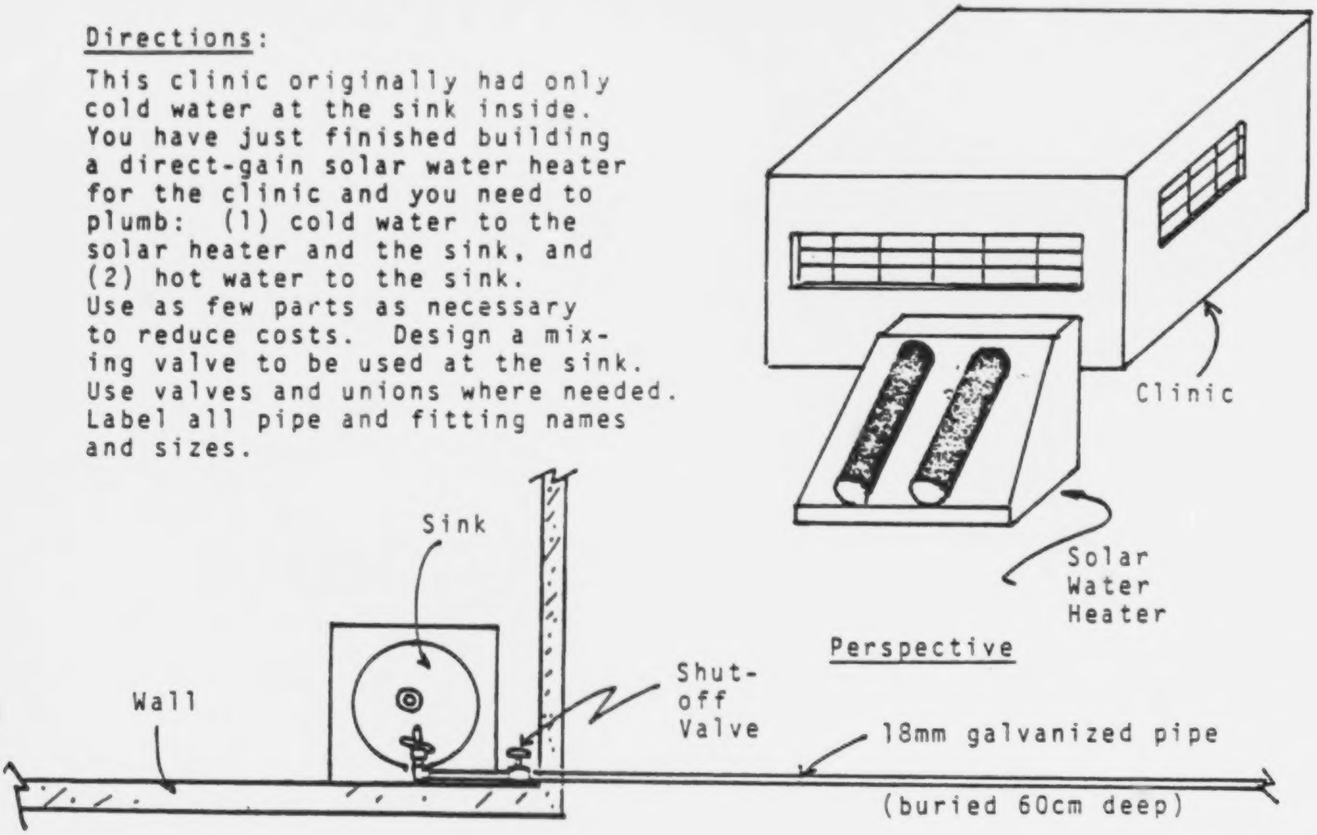
PLUMBING FITTING NOMENCLATURE

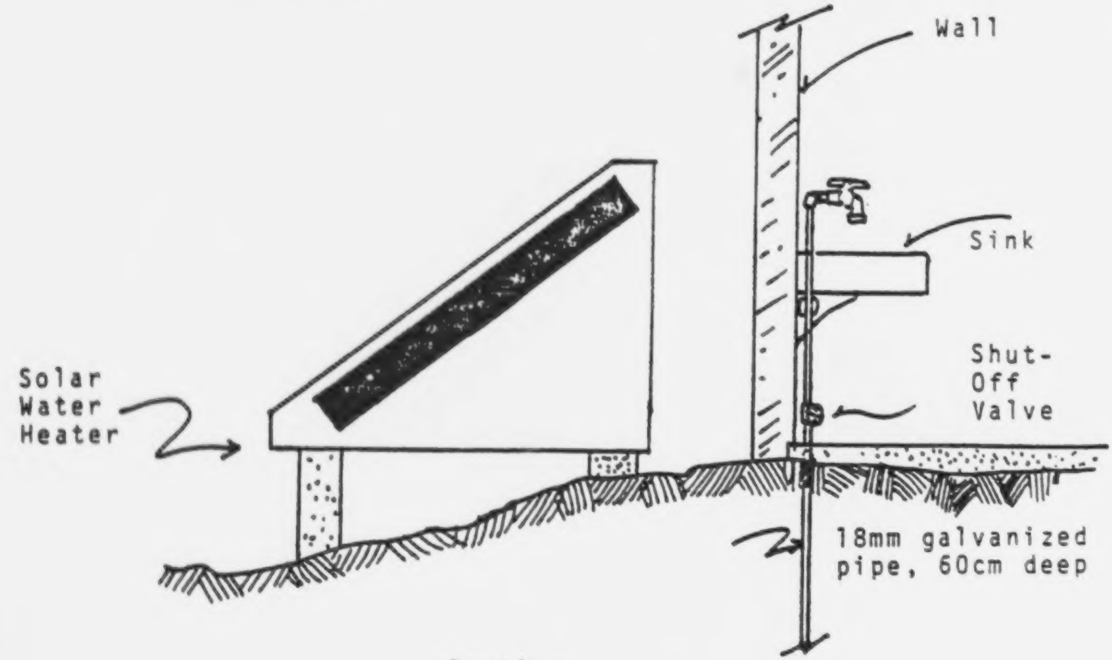
PLUMBING SCHEMATIC WORKSHEET

Directions:

This clinic originally had only cold water at the sink inside. You have just finished building a direct-gain solar water heater for the clinic and you need to plumb: (1) cold water to the solar heater and the sink, and (2) hot water to the sink. Use as few parts as necessary to reduce costs. Design a mixing valve to be used at the sink. Use valves and unions where needed. Label all pipe and fitting names and sizes.

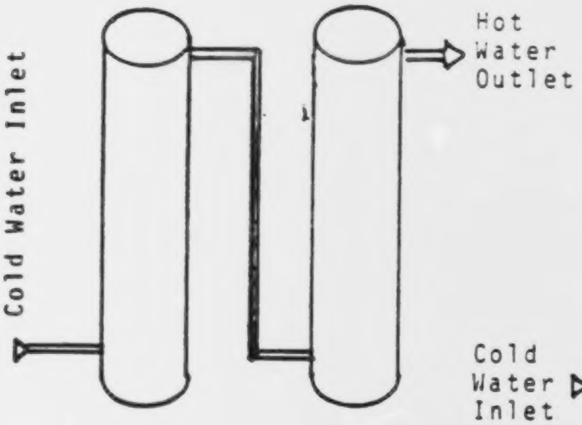

Clinic
Solar
Water
Heater
Sink
Wall
Shut-
off
Valve
18mm galvanized pipe
(buried 60cm deep)

Perspective

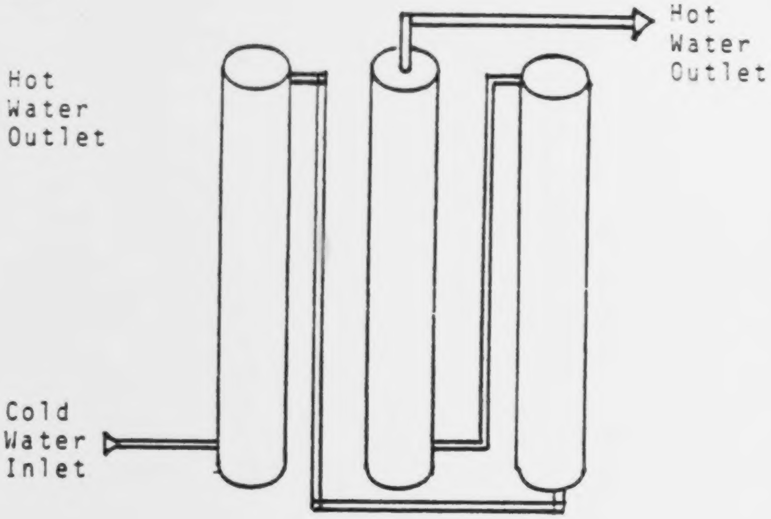

Wall
Sink
Shut-
Off
Valve
Solar
Water
Heater
18mm galvanized
pipe, 60cm deep

Section

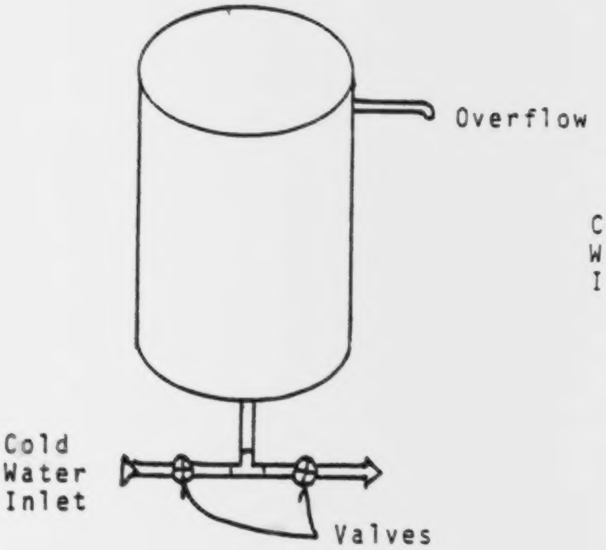
PLUMBING SOLAR WATER HEATERS


Cold Water Inlet
Hot Water Outlet

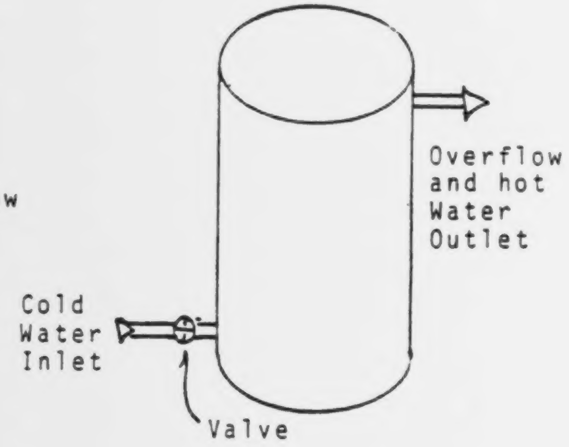
A two-tank, pressurized solar water heater system.


Hot Water Outlet
Cold Water Inlet

A three-tank, pressurized, solar water heater system.


Overflow
Cold Water Inlet
Valves

A one-tank, non-pressurized solar water heater system with mixing valves.


Overflow and hot Water Outlet
Cold Water Inlet
Valve

A one-tank, non-pressurized "overflow" solar water heater system.

SIZING A SOLAR WATER HEATER

Total time: 2 hours

Objectives:

- To use and discuss the solar water heating sizing formula and sizing rule of thumb
- To review and discuss the relationships between insolation, collector area, storage size and hot water demand
- To correctly orient a solar water heater
- To discuss how to pressure test a plumbing system

Resources:

- Attachment IV-6-A, "Rules of Thumb: Sizing a Solar Water Heater"
- Attachment IV-6-B, "Rules of Thumb: Orienting a Solar Water Heater"
- Attachment IV-6-C, "How to Size a Flat Plate Collector"
- Attachment IV-6-D, "How to Pressure Test a Plumbing System"
- Attachment IV-6-E, "Direct Gain Sizing Problems"
- Attachment IV-6-F, "Flat Plate Sizing Problems"

Materials: Newsprint and felt-tip pens

Trainer Notes

This session will require considerable preparation as you will need to make copies of each of the attachments and have them ready for distribution during the session.

Step 1. (5 minutes)
Post the objectives, outline and explain the session activities.

Trainer Notes

- It is helpful for one or more of the participants to volunteer to describe each attachment to the rest of the group as it is distributed.
- Encourage group discussion of each attachment and add your comments if the information offered by the volunteer is incomplete or inaccurate.

Continued

Trainer Notes/Continued

- Discuss each of the following questions completely to be certain that every participant understands the principles of each attachment.
- Encourage those who understand the principles to work with those who are having difficulty.

Step 2. (10 minutes)
Distribute, review and discuss Attachment IV-6-A, "Rules of Thumb: Sizing a Solar Water Heater."

Trainer Notes

To stimulate the discussion:

- Ask for the difference between a direct gain and a thermosiphon solar water heater.
- Ask for the sizing ratio of one group's insolation meter.

It is appropriate here to explain the difference between a "rule of thumb" and a formula and that the reason for having "rules of thumb" is that they are more easily understood by people with no technical background.

Step 3. (10 minutes)
Distribute, review and discuss Attachment IV-6-B, "Rules of Thumb: Orienting a Solar Water Heater."

Trainer Notes

Since most countries in which the PCVs will serve are within 15° of the equator, it is important that the participants use the sun charts or sun angle calculator from Phase III: Session 2, "The Path of the Sun," to describe the sun's path at or near the equator.

To stimulate and guide the discussion:

- Ask for the orientation of the tilt of a solar water heater if :
  1. You are on the equator, it rains every afternoon, every morning is clear and hot water is needed year-around.
  2. You are 15° south of the equator and only need hot water from September through March.
  3. You are 15° north of the equator, it rains every morning, the afternoons are clear and you need hot water year-around.

Step 4. (10 minutes)
Distribute, review and discuss Attachment IV-6-C, "How to Size a Flat Plate Collector."

Trainer Notes

Explain that the variables in each step of the attachment can have an effect on the size of the collector needed: if hot water usage doubles, the collector area and tank volume will have to double. If the number of people using the hot water doubles, then the collector area and storage tank volume will have to double, and so on.

Here are some sample discussion questions:

* Does each variable have a direct relationship to the collector area and storage tank volume (as in the examples given above) or an inverse relationship to the area and volume (i.e., if the insolation rate mysteriously doubles, the collector area and storage tank volume can be cut in half)?

* How important is "percent possible sunshine" to the equation?

* What do you think is the range of collector efficiencies?

* How can you determine the insolation rate for your own microclimate?

Be certain that each participant understands the logic behind the calculations, even if they don't understand the math.

Point out that Step 4 of this attachment leaves us with an area-to-volume ratio which is described as a rule of thumb in Attachment IV-6-A.

Step 5. (10 minutes)
Distribute, review and discuss Attachment IV-6-D, "How to Pressure Test a Plumbing System."

Trainer Notes

Allow time for everyone to read the attachment. Refer to the last session, Plumbing a Solar Water Heater, and discuss any questions about the attachment.

Step 6. (30 minutes)
Distribute and review Attachment IV-6-E and have the participants complete the problems. When they have finished, have them share and discuss their answers.

Trainer Notes

One option during this and other such exercises is to encourage people to work together, in groups of two or three. Although it is not the traditional way of taking a quiz or test, it does promote cooperation and learning and reduces frustration and unnecessary competition for "the best grade."

During the discussion of the answers, explain that:

* Direct gain solar water heaters work best when the desired final temperature is not above 55°C (130°F).

* Plumbed water heaters should have at least two tanks to reduce mixing of hot and cold water.

Step 7. (30 minutes)
Distribute and review Attachment IV-6-F and have the participants complete the problems. When they have finished, have them share and discuss their answers.

Trainer Notes

Remind the participants that they can use either the sizing formula or the sizing rule of thumb in this activity. During the discussion of the answers, note any difference between using the sizing formula and the rule of thumb.

Step 8. (15 minutes)
Conclude the session by reviewing the various methods used to size solar water heaters.

Trainer Notes

Explain that the participants will have an opportunity to apply the information from this session during the design and construction of solar water heaters.

Encourage any questions, comments or discussion.

RULES OF THUMB: SIZING A SOLAR WATER HEATER

Direct Gain Solar Water Heaters

Direct gain solar water heaters are usually sized at 80 liters of water storage for every square meter of collector aperture or area. This ratio of 80:1 will provide hot water (55°C or 130°F) in the afternoon of sunny, warm days if the tank is filled with cold water (15°C or 60°F) in the morning.

If this ratio is changed to 40 liters of water for every square meter of collector (40:1), then the water will heat up faster but will also cool off faster in the afternoon or at night if the tanks are not insulated.

If this ratio is changed to 120:1, the water will barely get warm (38°C or 100°F) but will retain its heat for many hours. This ratio is best used to pre-heat water which will be heated to a higher degree with another heat source. This is the most cost-effective ratio but provides the least hot water.

Flat Plate Collector Solar Water Heaters

The 80:1 ratio also holds true for flat plate collector solar water heaters. Flat plate collector systems, however, have the advantage that the solar heated water is stored in an insulated container so it is less likely to cool down in the afternoon or at night.

Ratios approaching 40:1 tend to be less cost effective. Since it is the collector that determines the total cost of the system, more collector with less storage will cost more and provide you with less hot water.

Ratios approaching 120:1 are more cost effective but will not heat water as hot as an 80:1 ratio system. A system with a ratio of 120:1 will warm the water most of the year, heat it up very well a few months of the year, but will need to be supplemented with another water heater to get hot water (55°C or 130°F) for most sunny and warm months of the year.

Experimenting

Build a solar water heater or an insolation meter when you get to your country and change the storage tank-to-collector aperture ratio to find which ratio will work best for you in your microclimate.

RULES OF THUMB: ORIENTING A SOLAR WATER HEATER

In North America, a common rule of thumb for orienting a solar water heater is to face it within 45° of true south (with true south being the optimal direction) at a tilt of "latitude plus 10 degrees." The Continental United States includes latitudes from 25° to 48°. Therefore, tilt angles can vary from 35° to nearly 60° from the horizontal.

As solar collectors approach the equator, orientation and tilt become more seasonal because the sun moves into both the north and south hemispheres during the course of the year. Therefore, orientation depends on when the solar energy is needed (which months) and the local microclimate (i.e., are there clear mornings or clear afternoons during the months when the solar energy is needed?). If a solar collector is on the equator and facing south with a tilt of 15° from the horizontal, it will work well during the months of September through March. However, from March until September, the sun will be behind the collector. If a solar collector is facing east with a tilt of 15°, it will collect well only during the morning hours. This orientation is best for locations with cloudy and/or rainy afternoons.

The best tilt for a solar collector on the equator is no tilt at all: a horizontal collector. This causes problems, however, with naturally circulating systems such as food dryers and thermosiphon water heaters: the air or water doesn't know which way to flow; it doesn't know which way is up. As soon as you tilt and orient a collector, it will only work half of the day or year.

Therefore, the tilt and orientation of a solar collector near the equator depends on what time of year the solar energy is needed and what part of the day is sunniest in the microclimate of the collector.

The orientation of a solar collector in the Southern Hemisphere should be toward the north, toward the equator. The tilt of the collector should be the same as for a Northern Hemisphere collector -- latitude plus 10°.

HOW TO SIZE A FLAT PLATE COLLECTOR

To properly design and construct a passive solar water heater, one needs to know the amount of energy required in the form of heated water and the amount of sunlight available on an average day during the time of least sunshine.

By simply dividing the energy required per day by the energy available per day per area, one can determine the area of collector aperture needed.

1. How much energy is required?

Find: Average hot water usage per person per day

Number of people using hot water per day

Desired temperature of hot water

Incoming cold water temperature

Density of water (weight per volume)

For example: 40 liters hot water per person per day
3 people per day
45 degrees C desired hot water temperature
15 degrees C incoming water temperature
Density of water is 1 Kg/liter

$$\frac{40\ \text{liters}}{\text{person day}} \times 3\ \text{people} \times (45-15^{\circ}\text{C}) \times \frac{1\ \text{kg}}{\text{liter}} = 3600\ \frac{\text{Kg}^{\circ}\text{C}}{\text{day}}$$

$$3600\ \frac{\text{Kg}^{\circ}\text{C}}{\text{day}} \times 1\ \frac{\text{Kgcal}}{\text{Kg}^{\circ}\text{C}} = 3600\ \frac{\text{Kgcal}}{\text{day}}\ \text{(energy required)}$$

2. How much energy is available?

Find: Clear day winter insolation for the desired tilt

Percent possible sunshine

Collector system efficiency

For example: 2700 Kgcal/m^2 day
65% possible sunshine
40% system efficiency

$$2700\ \frac{\text{Kgcal}}{m^2\text{day}} \times .65 \times .40 = 700\ \frac{\text{Kgcal}}{m^2\text{day}}\ \text{(energy available)}$$

3. By dividing the amount of energy required (Step 1) by the amount of energy available (Step 2) one can get a very good approximation of the collector aperture required to provide the desired temperature and volume of water on an average day during the period of least sunshine.

For example:

$$\frac{3600\ \frac{\text{Kgcal}}{\text{day}}}{700\ \frac{\text{Kgcal}}{\text{m}^2\text{day}}} = 3600\ \frac{\text{Kgcal}}{\text{day}} \times \frac{\text{m}^2\ \text{day}}{700\ \text{Kgcal}} = 5.1\ \text{m}^2$$

5.1 m^2 of collector aperture is needed to provide 120 liters of water at 45°C if the incoming water is at 15°C and the insolation is 2700 Kgcal/m^2 day.

(Notice how a complex fraction -- a fraction over a fraction -- can be simplified by "inverting and multiplying." Also note how the units will always cross out to leave just the units needed: in this case, square meters, or m^2.)

4. Once this ratio of aperture-to-volume is found, it can be used to size a collector for any size hot water tank, assuming all of the variables remain the same.

If the system will not be asked to provide hot water during the period of least sunshine (if, for example, there is virtually no sun for six months of the year), the clear day summer insolation for the desired tilt and the summer percent possible sunshine must be substituted for the winter data used in Step 2. Summertime system efficiency is also much greater than wintertime efficiency because there is less heat loss in the summer.

Care must be taken not to ask too much of a solar collector system: If a system is sized to provide hot water in the winter, it will probably produce very hot water in the summer, which is potentially dangerous (scalding occurs at water temperatures of 60°C).

HOW TO PRESSURE TEST A PLUMBING SYSTEM

1. To pressure test with water only:

   Cap or plug all openings in the system, except two. Of these two, loosely cap or plug one of them and attach a garden hose or some other water source to the other. Make sure that the loosely capped or plugged opening is near the top of the system.

   Begin filling the system. When water begins to leak from the loosely capped or plugged opening, tighten the cap or plug so that no water can escape. Inspect all joints in the system for leaks by looking for obvious ones and feeling each joint for any sign of moisture. Mark any leaky joints. Drain the system, fix the leaks and re-test.

2. To pressure test with water and compressed air:

   Cap or plug all but one opening near the top of the system. Fill the system with water using this upper opening. Attach a compressed air source to the system and compress to 50 pounds per square inch (3.5 Kg/cm^2) pressure or to the pressure at which the system will be operating, whichever is greater. Tap each joint with a wooden or rubber mallet to simulate expansion and contraction stresses. Look for water leaks at each joint. Mark all leaks, drain the system, repair the leaks and re-test. (If a pressure gauge is available, attach it to the system and test for 24 hours.)

3. To pressure test with air only:

   Cap or plug all but one opening of the system. Attach the pressure gauge tester to the remaining opening and compress with air to 50 psi or 3.5 Kg/cm^2 or the pressure at which the system will be operating, whichever is greater. Tap all joints with a wooden mallet to simulate expansion and contraction stresses. Listen for leaks. Leave the gauge on the system for at least 24 hours. If the gauge shows ANY decrease in pressure, there is a leak in the system. Leaks can be found by applying a soap-and-water solution to each joint and watching for bubble formations. Mark any leaks. Release the pressure from the system, fix the leaks and re-test.

DIRECT GAIN SIZING PROBLEMS

Given the following information, decide whether or not a direct gain solar water heater will be effective and, if so, find the number and size of tanks needed and the aperture needed to raise the water to the desired temperature.

Daily hot water volume requirement (liters)	80	200	240	300	400
Desired outlet temperature (0° C)	50	65	40	45	70
Inlet temperature (0° C)	15	20	20	15	20
Insolation available ($\frac{\text{Kgcal}}{\text{m}^2\text{day}}$)	2300	3000	2700	2500	2250
Will a direct gain solar water heater be effective? (Yes / No)	____	____	____	____	____
Number and size of tanks	____	____	____	____	____
Aperture area (m^2)	____	____	____	____	____

FLAT PLATE SIZING PROBLEMS

Given the following data, determine the size of storage tank and area of collector required. Assume a 50% efficiency on the collector.

Hot water volume requirement (liters/day)	100	120	40	200	20
Desired hot outlet temperature (0° C)	40	50	55	60	35
Inlet water temperature (0° C)	15	20	15	20	15
Insolation rate ($\frac{\text{Kgcal}}{\text{M}^2\text{day}}$)	2700	2500	2000	3000	2250
Percent possible sunshine (%)	75%	70%	65%	60%	50%
Size of tank(s)	____	____	____	____	____
Area of flat plate collector (m^2)	____	____	____	____	____

DEMONSTRATING A TECHNICAL CONCEPT

Total time:	2 hours
Objectives:	* To practice explaining, demonstrating and and transferring technical information * To identify and discuss effective communication techniques involved in transferring technical information
Resources:	* Attachment IV-7-A, "Role Play Descriptions" * Fuglesang, Applied Communication in Developing Countries * Hall, Beyond Culture
Materials:	Newsprint and felt-tip pens, hot plate and tea kettle (or coffee percolator or other steam source), .1m^2 (1 ft.^{2}) sheet of glass

Trainer Notes

This session will require considerable advance planning, study and preparation. You should familiarize yourself well with the procedures before beginning the session. Also, all the role play descriptions from Attachment IV-7-A should be read, cut out and organized for distribution in advance.

In this session, there are a total of six role play situations: three in which participants play PCVs and three in which they play villagers. Each participant will play the PCV role once and the villager role twice.

There will be one presentation done by each of the three PCV role play groups. While the first PCV role play group is doing its presentation, all the other participants will play the first villager role described in the attachment (Part II). Then, while the second PCV role play group is doing its presentation, all other participants will role play the second villager role. And, finally, while the third PCV role play group is doing its presentation, all other participants will take the third villager role.

Step 1. (5 minutes)
Briefly present the session objectives and review the procedures.

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Step 2. (10 minutes)
Have the participants divide into three groups and distribute the three PCV role play descriptions from Part I of the attachment.

Trainer Notes

- Distribute to each PCV group the "General Role Description."
- Distribute to PCV role play Group #1 the first "Specific Role Description."
- Distribute to PCV role play Groups #2 and #3 the second and third "Specific Role Descriptions" respectively.
- Give newsprint and felt-tip pens to PCV Groups #2 and #3.
- Give the glass and steam source to PCV Group #3.

Step 3. (25 minutes)
Have each PCV role play group prepare its presentation based on the information provided by the role descriptions.

Step 4. (10 minutes)
Reconvene all the participants and ask PCV role Group #1 to set up their presentation as you distribute and explain the First Villager role description (from Part II of the attachment) to all of the other participants.

Trainer Notes

Explain that while PCV role play Group #1 is doing their presentation, all other participants will be role playing villagers as described in the First Villager role description.

Step 5. (15 minutes)
Have PCV role play Group #1 do their presentation.

Step 6. (5 minutes)
Have PCV role play Group #2 set up their presentation as you distribute and explain the Second Villager role description (from Part II of the attachment) to all of the other participants.

Trainer Notes

Explain that while PCV role play Group #2 is doing their presentation, all other participants will be role playing villagers as described in the Second Villager role description.

Step 7. (15 minutes)
Have PCV role play Group #2 do their presentation.

Step 8. (5 minutes)
Have PCV role play Group #3 set up their presentation as you distribute and explain the Third Villager role description (from Part II of the attachment) to all of the other participants.

Trainer Notes

Explain that while PCV role play Group #3 is doing their presentation, all other participants will be role playing villagers as described in the Third Villager role description.

Step 9. (15 minutes)
Have PCV role play Group #3 do their presentation.

Step 10. (15 minutes)
Have all the participants regroup and discuss the effectiveness of each role play presentation.

Trainer Notes

* Encourage the participants to generalize about effective or ineffective communication techniques used during the presentations.

* As an aid to discussion, post the following:

  I hear, I forget; I see, I remember; I do, I understand.
  -Confucius-

* Mention that the use of all the senses is the best way to learn.

ROLE PLAY DESCRIPTIONS

Part I: PCV Role Descriptions

General Role Description to be distributed to every member of each PCV role play group.

You are PCVs in a small village in rural Africa where historically a high infant mortality rate has been experienced which has been attributed to amoeboic dysentary caused by unsanitary water. The youngest son of the village chief contracted this disease and recently died.

Concerned villagers, especially the chief, have asked you and your group to discuss ways of solving this problem. Your job, should you choose to accept it, is to explain the concepts of evaporation/condensation as they apply to solar stills and clean water.

* * *

Specific Role Descriptions to be distributed to group members only.

------------------------- Cut Here -------------------------

PCV Group #1: This culture does not permit use of gestures outside of the immediate family and does not appreciate material from outside of the immediate family nor any material from outside the village used for communication. Therefore, no visual aids or props can be used.

-------------------------Cut Here -------------------------

PCV Group #2: This village has a high degree of appreciation for non-verbal communication based upon designs and figures used in weaving. It is considered impolite for a non-villager to make speeches. Therefore, you may not as an individual speak more than two sentences at a time. Posters that you have previously drawn showing vectors of fly-borne disease have had a great impact in raising village consciousness.

-------------------------Cut Here -------------------------

PCV Group #3: In the past, this village has had limited exposure to Westerners and ideas of the West, so that there is understanding of visual symbols, pictures, alphabets and advertising. Local crafts are important to village life and skills are taught by elder craftsmen to young boys by apprenticeship. These young boys learn by doing.

ROLE PLAY DESCRIPTIONS

Part II: Villager Role Descriptions

---------------------------- Cut Here ---------------------------

First Villager: You are concerned about children dying, disapprove of gestures. You have a tradition of listening politely to and being cooperative with strangers. You are a dignified, serious and industrious people.

(Distribute to PCV Groups #2 and #3)

---------------------------- Cut Here ---------------------------

Second Villager: You are concerned about children dying, appreciate visual representations, do not like strangers to talk too much (it is improper for strangers to speak more than two sentences at a time). You have a tradition of listening politely to and being cooperative with strangers. You are a dignified, serious and industrious people.

(Distribute to PCV Groups #1 and #3)

---------------------------- Cut Here ---------------------------

Third Villager: You are concerned about the death of your children. You have little patience with listening to the expression of new ideas. You are anxious to learn by doing. You have a tradition of listening politely to and being cooperative with strangers. You are a dignified, serious and industrious people.

(Distribute to PCV Groups #1 and #2)

SHADE MAPPING AND SOLAR SITING

Total time: 2 hours

Objectives:
- To develop a shade map for solar site
- To determine a good solar site

Resources:
- Mazria, The Passive Solar Energy Book, pp. 325-327
- Attachment IV-8-A, "Plotting Azimuth and Altitude"
- Attachment IV-8-B, "Shade Mapping Worksheet"

Materials: Directional compasses, protractors, string, plumb bobs (such as 12mm nuts, rocks, etc.), newsprint and felt-tip pens

Procedures: Step 1. (5 minutes)
List the objectives and outline the session activities.

Step 2. (10 minutes)
Distribute Attachments IV-8-A and IV-8-B to each participant and explain them briefly.

Step 3. (40 minutes)
Have the participants form their solar work groups and develop a shade map for a potential solar site as shown in Attachment IV-8-A.

Trainer Notes

- Distribute one directional compass, protractor, string and plumb bob to each group.
- Circulate among the groups to see that everyone understands shade mapping. Offer assistance as needed. Be sure each group has its compass set properly, as shown in Attachment IV-8-A.

Step 4. (30 minutes)
Reconvene the groups and analyze the sun charts by having participants share and discuss their findings.

Trainer Notes

- * Demonstrate that a shade map can be analyzed by overlaying a sun chart with the shade mapping worksheet (Attachment IV-8-B) and looking through them toward a light source, such as the sun. If obstacles show above any of the sun paths, the potential solar site will be shaded at that time of year and that time of day. If the shading is or will be substantial, another site will have to be found.
- * Have each group describe their potential solar site and their analysis of that site.
- * Ask what range of azimuths need to be considered for possible shading problems at the training site.
- * Ask where the "solar window" is on the sun chart.

Step 5. (20 minutes)
Have the groups develop another shade map.

Trainer Notes

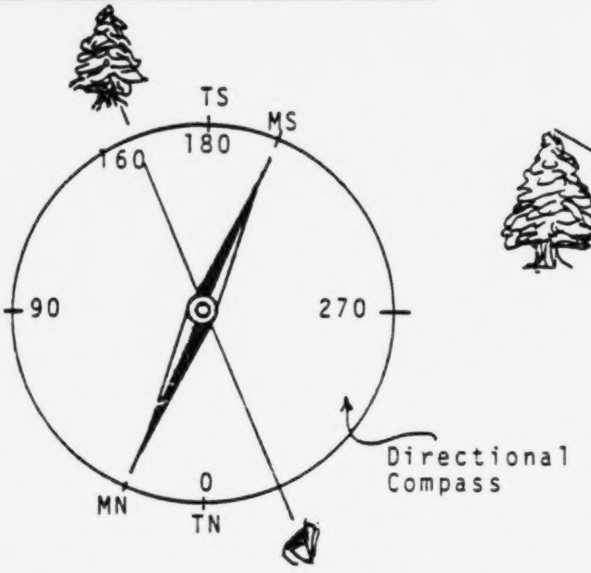
- * Participants can be given the choice of developing a shade map for either a hypothetical site on the equator or a site in the country in which they will be serving.
- * Encourage different people to do the siting and recording so that all of the group members get practice and understand the process.

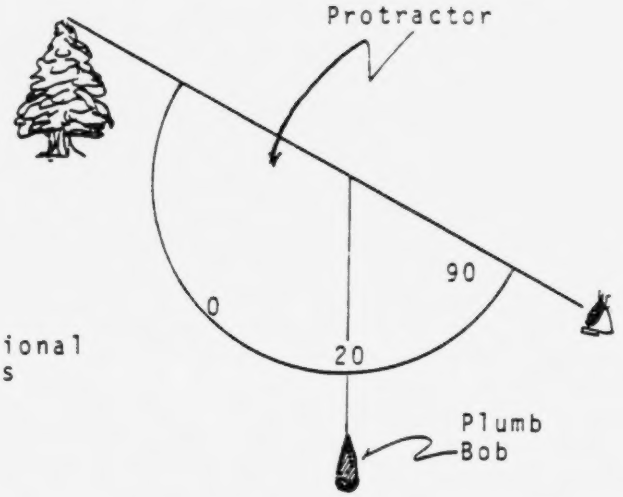
Step 6. (20 minutes)
Reconvene the groups and discuss the findings.

Trainer Notes

- * Ask what range of azimuths need to be considered on the equator or in the host countries.
- * Explain that the solar sites located by the groups during this session can be used as locations for their solar collectors during the next two phases.
- * Mention that the groups have the option of designing solar collectors for the training site or for their host country (if they're not the same) since the orientation and tilt may be different.

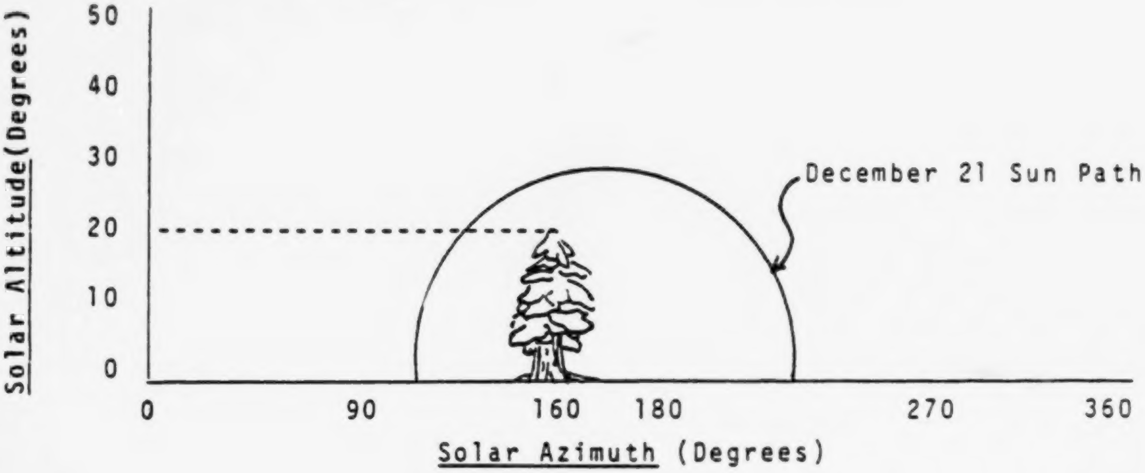
PLOTTING AZIMUTH AND ALTITUDE





Step 1 Find the azimuth of the obstacle (tree) by lining up your eye, the center or the compass and the obstacle. Be sure the compass is corrected for magnetic variation. Read the azimuth of the obstacle, 160° in this example.

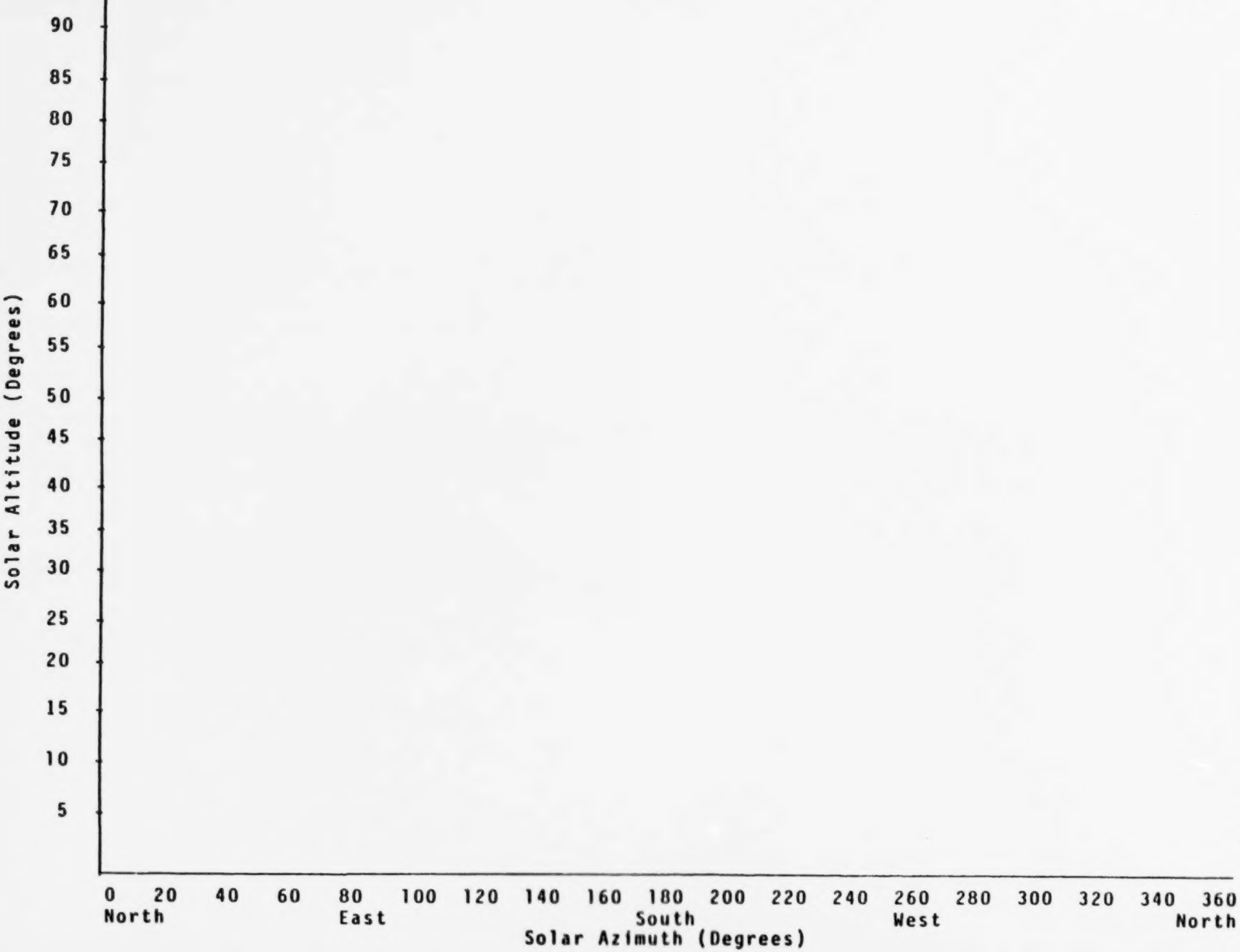
Step 2 Find the altitude by lining up your eye with the top of the obstacle along the straight edge of the protractor. The plumb bob will register the altitude, 20° in this example.



Step 3 Plot the azimuth (160° from Step 1) and the altitude (20° from Step 2) on the shade mapping worksheet as shown. If the December 21 sun path does not cross the image of the obstacle (tree), the obstacle will not shade the collector at this solar site.

Step 4 Locate all possible obstacles and plot them on the shade mapping worksheet. Analyze the data to determine if the potential solar site is actually a good solar site.

SHADE MAPPING WORKSHEET



DESIGN OF SOLAR WATER HEATERS

Total time: 4 hours

Objectives:

- To design a solar water heater
- To examine group dynamics and discuss decision-making styles

Resources:

- Burton, "Vertical and Horizontal Passive Solar Water Heater Plans"
- Baer, "Pro and Breadbox Solar Water Heater Plans"

Trainer Notes

The above resources should be available for use in this session.

Materials: Notebooks, pens, pencils, newsprint, felt-tip pens, drawing paper, T-squares, rulers, etc.

Procedures: Step 1. (5 minutes)
Present the objectives and describe the session activities.

Step 2. (3 hours)
Have the participants form work groups, decide on a solar water heater design and develop a complete set of plans.

Trainer Notes

- Explain that each group should begin the design process by identifying criteria for their solar water heaters. Criteria could be: low cost, simplicity, use of available materials, use of hand tools, durability (5 years), easily built and understood by non-technical people, etc.
- Explain that their plans should include: a materials list, a tools list, an estimated cost and a design drawing.
- Explain that one way for the group to decide on a design is to have each member of the group sketch as many solar water heaters as possible on notebook paper, then pick one sketch from the pile that best fits the group's criteria.
- Remind the participants that they will have only 20 hours to build and test their solar water heater, so the design should not be too complex.

Continued

Trainer Notes/Continued

- Mention that before construction can begin, each design must be checked for completeness and simplicity by the trainer and that the plans should include materials and tools lists.

- Explain that during this process, the group members should observe the group's decision-making styles since it will be discussed later in this session.

- Circulate among the small groups and offer your assistance. Do not force your ideas on the group. Encourage and support their design.

- An option here is to show the groups the copies of the solar water heater plans (from the Resources) to serve as a reference to the work they have done.

Step 3. (30 minutes)
Reconvene the groups and have them present their design criteria and their plans. Encourage questions, comments and discussion.

Trainer Notes

- As the groups are presenting their designs, provide any necessary suggestions for improving feasibility, completeness and simplicity.

- Remind the groups that you will be reviewing their plans in more detail before they begin construction.

Step 4. (20 minutes)
Review and discuss the dynamics of each construction group.

Trainer Notes

The following questions will stimulate and focus the discussion of each group:

- Who did what in the group during the design portion of the session?
- How were decisions made?
- How well did the group function?
- How were problems resolved?

For more detailed information regarding group decision-making styles, refer to Phase I: Session 12, "Earthen Block Molds."

Step 5. (5 minutes)
Briefly review the session and conclude by explaining that the next session will involve the construction of solar water heaters using the plans developed during this session.

CONSTRUCTION OF SOLAR WATER HEATERS

Total time: 20 hours

Objectives:

* To use various tools in the construction of solar water heaters

* To build, monitor and assess a solar water heater

* To recognize and solve problems within the construction group

* To develop and present a complete explanation of the solar water heater

Resources: Attachment IV-10-A, "Monitoring and Assessing a Solar Water Heater"

Materials: Various size and shape water containers, from 4 liters (1 gallon) to 64 liters (16 gallons), flat black paint, sheet metal (aluminum, steel), wood (various sizes and lengths of dimensional lumber, plywood, etc.), sheet plastic, sheet vinyl, glass panes, insulation materials (straw, newspaper, cardboard, etc.), assorted and various tools (saws, shears, paint brushes, hammers, screwdrivers, putty knives, pencils, squares, nails, screws, bolts, pipe wrenches, pipe cutter, pipe vise, pipe threader, thread-sealing compound, pipe-threading oil, various lengths of pipe (12 and 18 mm I.D. galvanized and PVC plastic) and fittings (elbows, tees, couplings, valves, lock nuts, etc.).

Procedures:

Trainer Notes

This 20-hour session allows much latitude for individual trainer styles. It follows a format similar to the construction session for pedal/treadle power in Phase III. The following notes are here to give you some guidance and share some experiences that have worked well during past training programs.

The session does not have to happen all at once. Since it is a 20-hour session, it should be complimented with other sessions, such as Health and Nutrition, the Role of the Volunteer in Development and other Core Technology sessions (See Phase calendar). It is helpful, in fact, to spread the construction time over as many days as possible, because the participants will then have more "spare time" to discuss their projects and their problems outside of session time. A four-hour session, however, should be considered a minimum, since tools and materials have to be set up and cleaned up. Six or eight hours of the day gives

Continued

Trainer Notes/Continued

the participants plenty of time.

Construction naturally follows design. Those groups with complete water heater plans (design drawings, materials lists, tool lists, etc.) should proceed with construction without waiting for the other groups. Therefore, some groups may begin slightly sooner than other groups.

Step 1. (Approximately 16 hours)
Have participants form construction groups and construct, test, modify and evaluate their solar water heater. Distribute and explain Attachment IV-10-A to help the participants with their assessment.

Trainer Notes

At the beginning of each construction period, have the participants discuss the events of the preceding day. Focus the discussions on the group dynamics and problem-solving methods that are being used by each group, what's working and what's not working, etc. This should take 15-25 minutes, depending on how many issues need to be brought up.

Remind the participants of how many hours remain in the construction part of the phase and that some time near the end of the phase should be spent on the development of a presentation for their device. When time begins to get short, encourage the participants to focus on the essential tasks only and to split them among group members to help speed up the process.

During the construction periods, you should keep in touch with how the groups are proceeding, taking time when necessary to show people how to properly use and care for tools.

Don't intervene every time the group or an individual makes a mistake. Mistakes are an important part of the learning process. Intervene only if the safety of the group is in danger or if a certain decision will prove fruitless and take a large amount of time away from the group.

Explain that any group that finishes one project may go on with another small project or begin preparations for the presentation of their device or do research on other types of solar construction.

Allow 10-20 minutes at the end of each construction period for cleanup of the work site and shop area.

Continued

Trainer Notes/Continued

At the end of the final construction session, plan about a half-an-hour for a thorough cleanup of the work site and shop area.

Step 2. (Approximately 4 hours)
Have the participants prepare for the final presentation of their solar water heaters. Provide them with relevant hints or guidelines.

Trainer Notes

The final presentation of the solar water heater should be given by the participants as if they were presenting their solar device to their in-country counterparts or a group of villagers.

It should be thorough and not too technical.

The participants should be encouraged to be creative in their final presentations. Encourage them to use such non-formal education techniques as posters, puppets, diagrams, drawings and discussions.

The presentation does not have to be a straight lecture presentation, although this is always an option. Explain that they should try to think of ways to involve the people watching the presentation, to get their participation. Above all, stress the need for creativity, experimentation and various communication techniques.

MONITORING AND ASSESSING SOLAR-HEATED TEMPERATURE AND VOLUME

Each group should establish procedures to measure the amount and temperature of water. You will need a thermometer and a pre-measured container for the water and a pen and paper to record the data each time the water is used.

Be sure to include the time of day the water was taken, the amount, the temperature and any relevant comments.

Plot a graph that illustrates water quantity vs. temperature.

From the graph and the data collected, determine how much water was available above the temperature stated in the heater design specifications.

Please answer the following questions:

- * Was the water heater properly sized for the volume and temperature required during the activities?
- * Does the system provide the volume and temperature to meet the design specifications?
- * If your yearly income was less than $5,000 per year, would you invest in this water heater? ($100 per year?)

MULTI-MEDIA STANDARD FIRST AID

Total time: 8 hours

Objectives:

- To discuss cross-cultural factors which influence the way in which first aid is applied
- To discuss first aid as an appropriate technology for health
- To develop first aid skills and knowledge

Resources:

- American Red Cross, Multi-Media Standard First Aid Instructor's Manual
- Werner, Where There Is No Doctor, pp. 75-106

Trainer Notes

- The Multi-Media Standard First Aid course offered by the American Red Cross provides a film, a student workbook, a first aid text and a final examination.
- This course can be obtained by contacting in advance any American Red Cross office. Outside of the United States, the central Red Cross office in the capital city should be contacted.

Materials: Film, projector and screen. Chalkboard or newsprint and felt-tip pens.

Trainer Notes

The Multi-Media course packet includes all necessary materials (bandages, splints, blankets, certificates, etc.) for conducting this course.

Procedures:

Trainer Notes

The Multi-Media course is recommended and covers all areas of emergency "first response." The course certifies participants in basic first aid for two years. It must be administered by a certified instructor. If any participants are already certified, they may serve as technical assistants. The course is designed in four units and can be given in one full day or spread out over several days.

Continued

Trainer Notes/Continued

If there are more than 15 participants, it is recommended that you obtain assistance from an additional certified instructor.

Step 1. (20 minutes)
Give a brief introductory talk and encourage a discussion about the role of the Volunteer in emergency situations.

Trainer Notes

Include the following points:

* A definition of first aid.
* An understanding that the role of the volunteer does NOT include being a "barefoot doctor"
* The issue of fear and panic as a response to emergencies
* The appropriate applications in crosscultural settings (sex roles, customs, legalities, etc.)
* The idea of first aid as an appropriate technology for health and self-reliance

Step 2. (7 hours, 30 minutes)
Conduct the four units of the course as described in the Instructor's Manual.

Step 3. (10 minutes)
Reconvene and evaluate the first aid course.

Trainer Notes

The following questions will stimulate discussion:

* Do you feel the course has prepared you to respond to emergency situations?
* Was the format effective?
* How could the session be improved?

Encourage participants to investigate in-country emergency volunteer facilities.

WIND TECHNOLOGY

Total time:	2 hours
Objectives:	* To describe the characteristics of a good wind site * To identify several types of wind machines and their major uses * To discuss advantages and disadvantages of locally-designed and built wind machines
Resources:	* Attachment IV-12-A, "Good and Bad Sites for Wind Machines" * Attachment IV-12-B, "Dempster Typical Windmill Installation" * Attachment IV-12-C, "Wincharger 12 Volt Wind Electric Battery Charger" * Attachment IV-12-D, "Savonious Rotors and Other Wind Machines" * Attachment IV-12-E, "Wind Power Formula" * Barnhart and Hirschberg, The New Alchemy Sailwing * Moore, Pradera Windmill * VITA, "Horizontal Axis Sail Rotor Windmills"
Materials:	Newsprint, felt-tip pens, notebooks, pens and pencils

Trainer Notes

There are direct uses of solar energy, such as solar water and space heating. But there are also indirect uses of solar energy, such as water and wind power. This session serves to introduce participants to one of these indirect uses of solar energy.

This session is included in response to what has been a continually expressed felt need on the part of previous program participants, i.e., to understand wind technology as an example of indirect solar energy.

Continued

Trainer Notes/Continued

This is intended as an optional session which can be used as a format for the discussion of other indirect applications of solar energy. (For example, hydraulic rams, micro-hydroelectric power, solar stills, solar cookers, biogas production, cookstoves, etc.) The choice of the session theme should be a response to participant's needs and/or in-country programming needs.

The "Discussion Questions" (See Step 2) should be modified to reflect the chosen theme. They should be written out on newsprint prior to beginning the session.

Step 1. (5 minutes)
Present the objectives and describe the session activities.

Step 2. (15 minutes)
Post, review and clarify the "Wind Technology Discussion Questions."

Trainer Notes

Post, on newsprint, the following questions, leaving space between each question for filling in responses (See Step 3):

Wind Technology Discussion Questions

1. What are some characteristics of a good wind site?
2. What are some types or styles of wind machines?
   a. Mass-produced
   b. Locally-made
3. What are some potential applications of wind machines?
4. What are some advantages and disadvantages of locally-designed and -built wind pumps versus imported U.S. multi-blade wind pumps (i.e., in Africa)?
5. How does $P = V^3 d^2$ relate wind machine power to wind velocity and blade diameter?

Remember to leave ample space between each question for filling in the responses.

Step 3. (20 minutes)
Have participants form groups of 3 to 5 people and develop responses to the "Discussion Questions."

Trainer Notes

- * Ask that one member of each small group copy the questions and record the group's responses.
- * You should circulate among the groups to see if they need any help.

Step 4. (40 minutes)
Reconvene the groups and encourage a discussion of their responses.

Trainer Notes

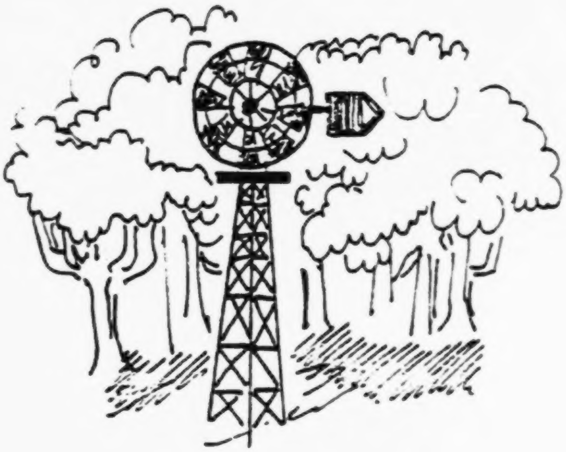
- * As the responses are being discussed, you should note appropriate answers to the questions in the space under each question on the posted newsprint.
- * Be sure that all participants understand the answers to each question.
- * Ask those participants who understand the concepts being discussed to assist those who are having more difficulty.

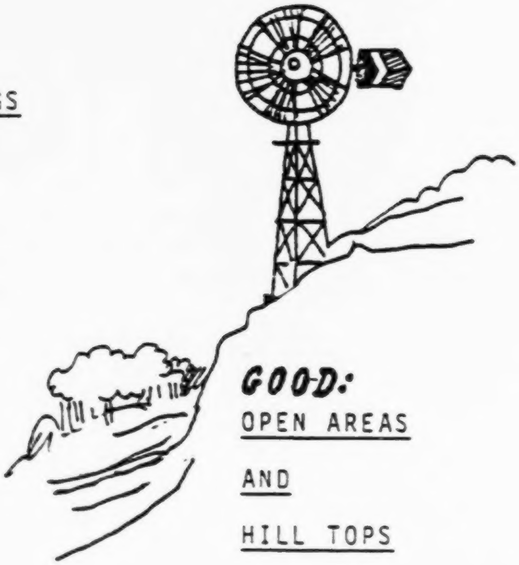
Step 5. (30 minutes)
Distribute and explain the attachments and other available wind technology resources (See "Resources").

Step 6. (10 minutes)
Conclude the session by reviewing the objectives and checking to see if they were met.

GOOD AND BAD SITES FOR WIND MACHINES

BAD: NEAR TREES OR BUILDINGS





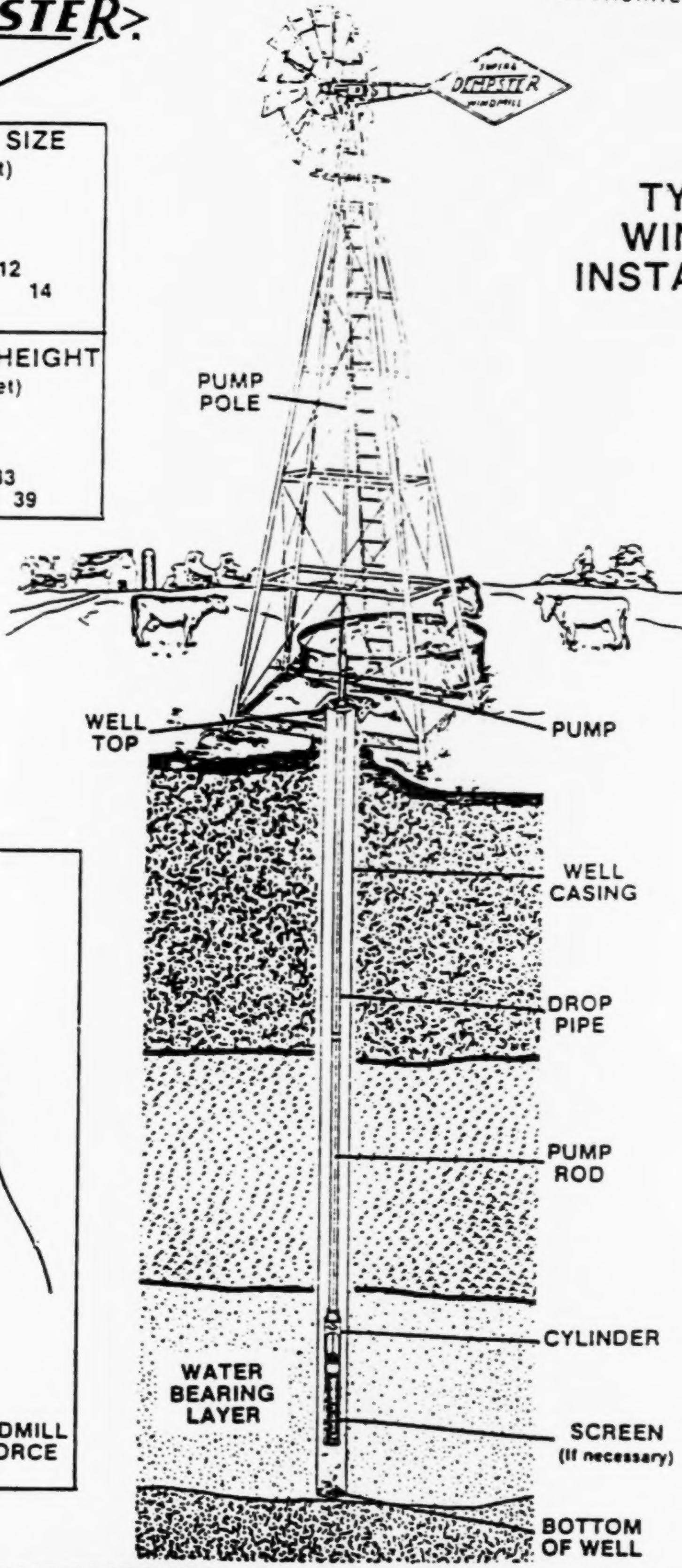
GOOD:
OPEN AREAS
AND
HILL TOPS

DEMPSTER

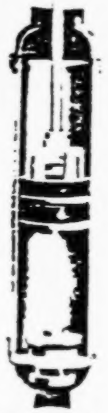
WHEEL SIZE
(Feet)
6
8
10
12
14

TOWER HEIGHT
(Feet)
22
28
33
39

TYPICAL WINDMILL INSTALLATION

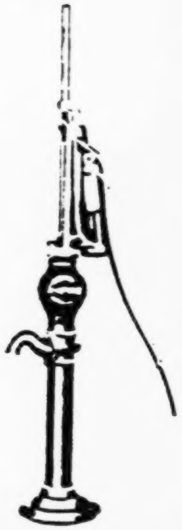

DEMPSTER
PUMP POLE
WELL TOP
PUMP
WELL CASING
DROP PIPE
PUMP ROD
CYLINDER
WATER BEARING LAYER
SCREEN (If necessary)
BOTTOM OF WELL

WELL CYLINDER

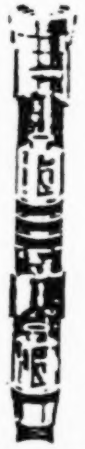


CLOSED TOP
(Normal Use)
Shallow Well

PUMP



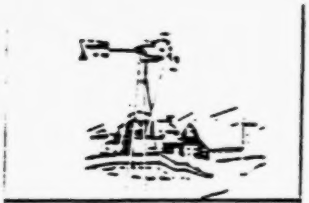
HAND & WINDMILL OPEN OR FORCE PUMP

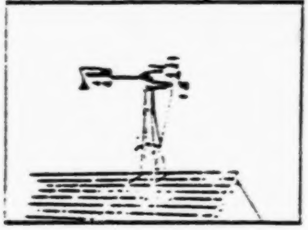


OPEN TOP
(Deep Wells)
Remove the Plunger Assembly without pulling Pipe or Cylinder

DEMPSTER INDUSTRIES INC., Beatrice, Nebraska 68310 (402) 223-4026

Form 2458A - 8/77
Revision 1 - 3/80





GET

MAXIMUM POWER

FROM THE

FREE WIND

WITH A

HEAVY DUTY 12 VOLT

12 VOLT WIND ELECTRIC BATTERY CHARGER

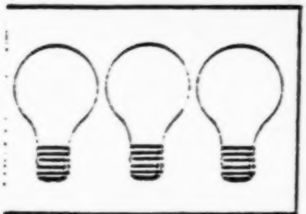
ATTACHMENT IV-12-C - Page 1

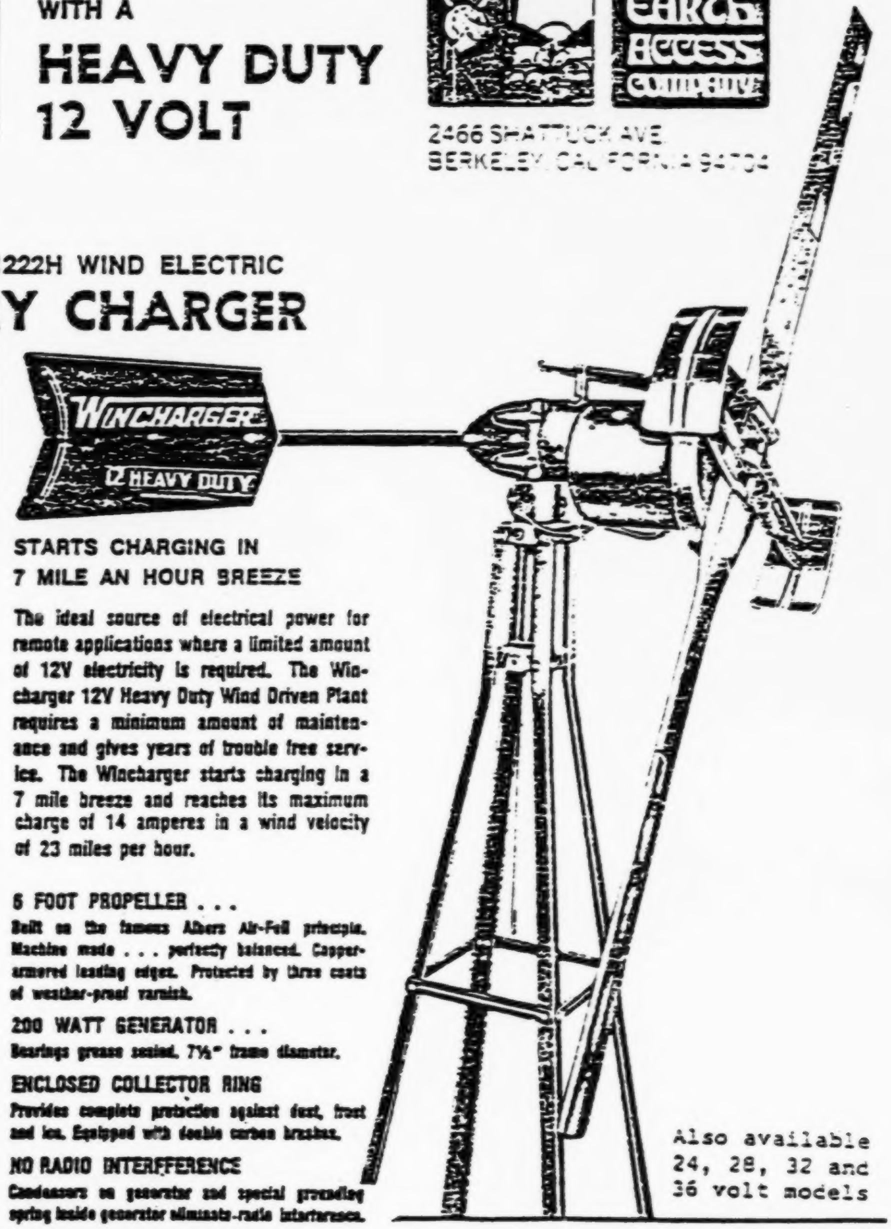
WHOLE EARTH ACCESS COMPANY

2466 SHATTUCK AVE.
BERKELEY, CALIFORNIA 94704

MODEL NO. 1222H WIND ELECTRIC

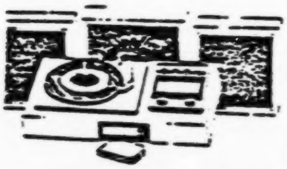
BATTERY CHARGER

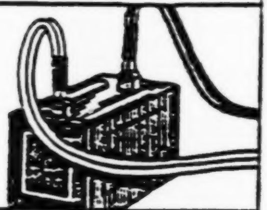




STARTS CHARGING IN
7 MILE AN HOUR BREEZE

The ideal source of electrical power for remote applications where a limited amount of 12V electricity is required. The Wincharger 12V Heavy Duty Wind Driven Plant requires a minimum amount of maintenance and gives years of trouble free service. The Wincharger starts charging in a 7 mile breeze and reaches its maximum charge of 14 amperes in a wind velocity of 23 miles per hour.





6 FOOT PROPELLER . . .
Built on the famous Albers Air-Foil principle. Machine made . . . perfectly balanced. Copper-armored leading edges. Protected by three coats of weather-proof varnish.

200 WATT GENERATOR . . .
Bearings grease sealed. 7½" frame diameter.

ENCLOSED COLLECTOR RING
Provides complete protection against dust, frost and ice. Equipped with double carbon brushes.

NO RADIO INTERFFERENCE
Condensers on generator and special grounding spring inside generator eliminate radio interference.

STRONG WINCHARGER TOWER
Model 1222H mounts on sturdy 10 foot 4-leg angle iron tower. Rigidly braced . . . newest construction features. All parts fit perfectly to make erection simple.

Also available
24, 28, 32 and
36 volt models

WINCO
Division of DYNA TECHNOLOGY, INC.
SIOUX CITY, IOWA 5110

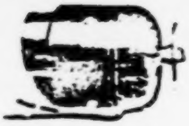
HEAVY DUTY
12 VOLT
MODEL No. 1222H
WIND ELECTRIC

WINCHARGER

ATTACHMENT IV-12-C - Page 2

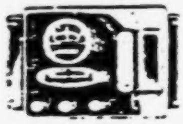
STANDARD EQUIPMENT INCLUDES:
- INSULATED INSTRUMENT PANEL
- 6 FOOT PROPELLER
- 200 WATT GENERATOR
- ENCLOSED COLLECTOR RING
- AIR BRAKE GOVERNOR
- 10 FOOT WINCHARGER TOWER

LARGE. STURDY GENERATOR

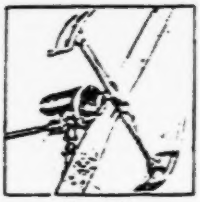


Wincharger's heavy duty, 4 Pole 7½" diameter generators are built for long life and low maintenance. Ball bearings are permanentally sealed.

INSULATED INSTRUMENT PANEL



Completely wired. Connections marked for easy installation. Reverse current device. Ammeter shows amount of charge or discharge. Voltage regulator not available.

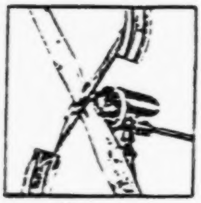


"Normal"

PATENTED AIR-BRAKE GOVENOR

Operates by centrifugal force. When wind velocity exceeds 23 miles per hour, governor flaps automatically open and spread wind away from propeller (See illustration). Governor also acts as a fly wheel to maintain even propeller speed and eliminate vibration in gusty wind.

Tower can be mounted on pitched roof, on a mounted platform, or on any flat surface of any height.



"Governing"

Optional Voltage Available at extra cost
24 volt, 28 volt, 32 volt and 36 volt

CHARGING RATES:

Revolutions Per Minute	Amperes
270	0
350	2½
440	6
570	10
700	12
900	14

MANUFACTURED BY

WINCO
Division of DYNA TECHNOLOGY.
East Seventh at Division st.
P. O. Box [illegible]
Sioux City, Iowa 51102

SPECIFICATIONS

Tower	10 Feet High
Propeller Type	2 Blade
Size	6 Feet
Material	Wood
Gear Ratio	Direct
Generator	7½" Diameter 4 Pole

Capacity (Watts)	200
Approximate Maximum Amps.	14
Approximate Maximum Volts	15
Generator Speed Range (RPM)*	270/900
Governor Type	22" Air-Brake

WEIGHTS	Net	Domestic Shipping	Export Shipping	Vol. Cu. Ft.
Generator and Parts	61 Lbs.	67 Lbs.	93 Lbs.	1.7
Tower and Propeller	70 Lbs.	74 Lbs.	103 Lbs.	3.0
Governor Assembly	3 Lbs.	4 Lbs.	7 Lbs.	.4

Propeller Speed Range (RPM)*	270/900
Wind Speed Range (MPH)*	7/23
Voltage Regulator	Not Available

Average Usable KWH per month	
10 MPH Average	20
12 MPH Average	26
14 MPH Average	30

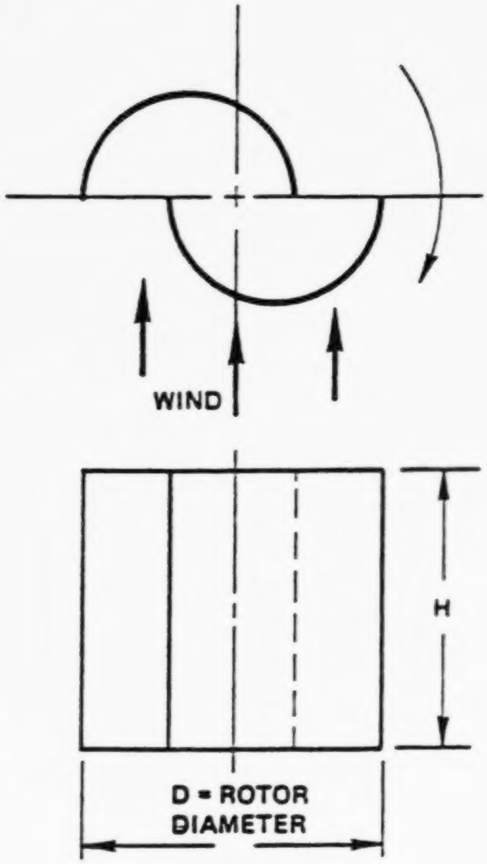
Size Battery Recommended (Battery not included)	230 A.H.
No. Battery Cells	6
Volts per Cell (When fully charged**)	2.5

* Wind and Propeller and Generator speed ranges as given indicate first the speed that is required to begin charging the battery and then the speed required for the governor to begin operation.

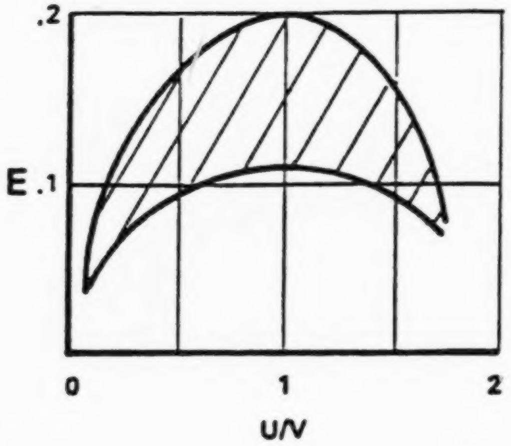
For example: On Model 1222 the propeller begins charging the battery at 280 RPM which corresponds to a generator speed of 280 RPM and a wind speed of 7 MPH. Governing speed is reached at 700 RPM, which corresponds to a generator speed of 700 RPM and a wind of 23 MPH.

For lead acid batteries only.

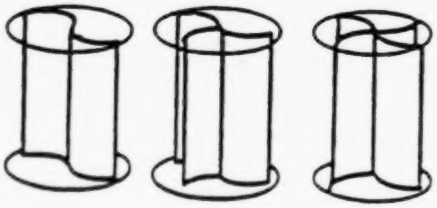
SAVINIOUS ROTORS AND OTHER WIND MACHINES


WIND
H
D = ROTOR
DIAMETER

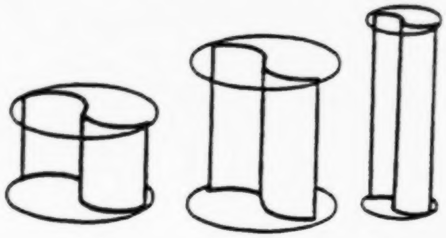
SINGLE TIER
SAVONIOUS



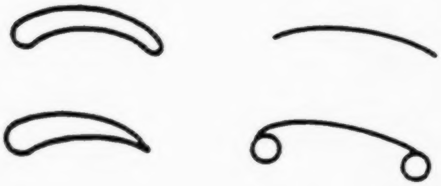
NUMBER OF VANES



ASPECT RATIO

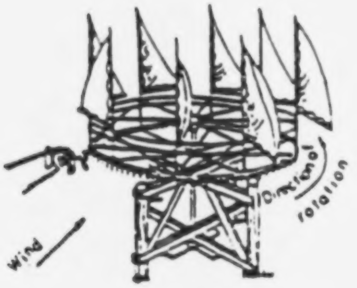


VANE FORM

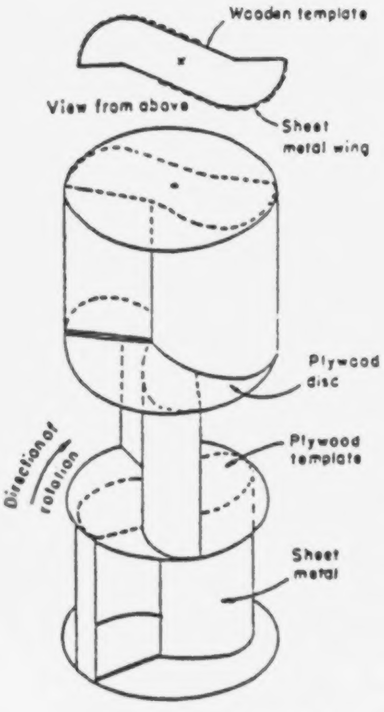


CONFIGURATIONS

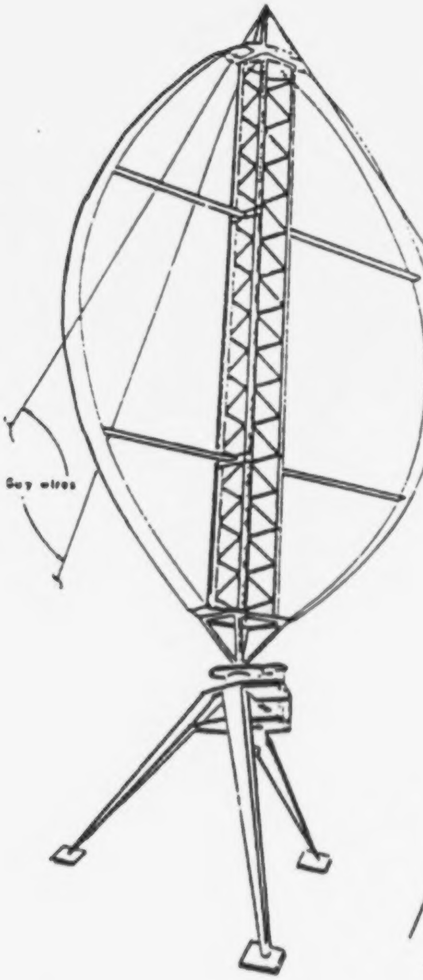
SAVONIOUS ROTORS AND OTHER WIND MACHINES/CONTINUED


Directional rotation
Wind

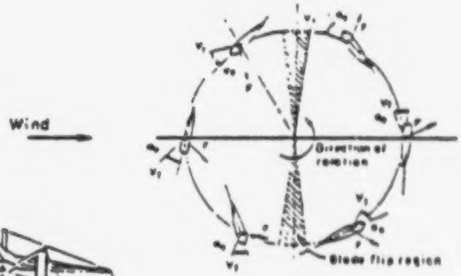
Thai jib-sail rotor


Wooden template
View from above
Sheet metal wing
Plywood disc
Plywood template
Directional rotation
Sheet metal

Three-tiered Savonius rotor



Darrieus rotor


Wind
Direction of rotation
Blade flip region

Gyrorotor blade modulation

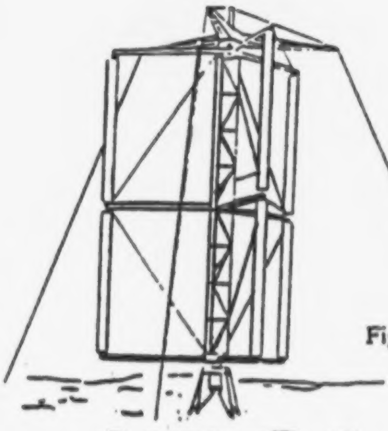


Figure 21. Gyro rotor

437

WIND MACHINE POWER FORMULA AND SITING

$P = V^3 d^2$

Where: P = Power available from the wind generator

V = Velocity or speed of the wind

d = Diameter of the propeller

VOLUNTEER IN DEVELOPMENT
PART 2: WOMEN IN DEVELOPMENT

Total time:	2 hours
Objectives:	* To discuss Women in Development issues * To discuss the role of the Peace Corps Volunteer in relation to Women in Development issues
Resource:	Huston, Third World Women Speak Out
Materials:	Newsprint and felt-tip pens

Trainer Notes

There are two optional activities outlined in this session, each designed to independently meet the session objectives. Both need preparation.

Option #1: Requires the formation of a discussion panel of Third World women
Option #2: Depends on the preparation of discussion leaders selected from among the participants and requires providing them with copies of the resource book, Third World Women Speak Out

Option #1, panel of Third World women

Trainer Notes

- The discussion panel should consist of from 3 to 5 Third World women.

- There are several ways to go about forming the discussion panel. If the training program is outside the United States, it may pose no problem because you can call on staff and/or friends. Programs within the United States may require your contacting a nearby university. Most universities have a foreign student office and are generally accustomed to responding to requests for foreign student speakers.

- After you have identified the panel members, meet with them ahead of time, briefing them on the session objectives and procedures. Also explain to them that they will be asked to speak on the topics related to Third World women identified in Part 1 of Women in Development (See Phase III: Session 19). It is important that the panel members understand they will be asked to speak informally for up to ten minutes at the beginning of the session. Be certain to allow sufficient time for them to prepare.

Procedures: Step 1. (10 minutes)
State the session objectives. Introduce the panel members and outline the procedure for the panel discussion.

Trainer Notes

> Mention the topics related to women in development that were identified by the participants during Phase III: Session 19.

Step 2. (30 - 50 minutes)
Have each of the panel members give a brief talk (up to 10 minutes) on individual perceptions of the roles of women in development.

Step 3. (55 - 1 hour, 15 minutes)
Open the panel to questions and discussion.

Step 4. (5 minutes)
Close the panel by briefly summarizing any conclusions and thanking the panel members for their participation.

Option #2, Women in development discussion panel

Trainer Notes

> To prepare for this activity you will need five volunteers from among the participants to act as discussion leaders/facilitators. Remind the volunteers of the topics identified in the previous women in development session (Phase III: Session 19). Explain that each of them should select a chapter from Huston's Third World Women Speak Out and prepare a brief (up to 10 minute) report on the chapter, highlighting any situations that refer to any of the women in development topics. Also, explain that during the session they will be asked to facilitate a 10-minute discussion on their reports. Mention that they should focus the discussion on what role might be played as Peace Corps Volunteers in trying to improve the situation of women. Inform them that time will be set aside at the end of the session for feedback on their facilitation skills.

Procedures: Step 1. (5 minutes)
Review the session objectives, outline the session activities and introduce the discussion leaders/facilitators.

Step 2. (1 hour, 40 minutes)
Have the first discussion leader/facilitator present the 10-minute report and facilitate a 10-minute discussion on the report, including comments on the role that might be played as

Peace Corps Volunteers in trying to improve the situation of women in the Third World.

Trainer Notes

Repeat the process for each discussion leader/facilitator.

Step 3. (5 minutes)
Discuss and summarize some of the key points which were brought out by the reports.

Step 4. (10 minutes)
Conclude by encouraging feedback on the facilitation skills of the discussion leaders/facilitators.

Trainer Notes

Elicit feedback by asking the following questions:

- What did you like best about (name of facilitator)'s report and facilitation of discussion?
- What could have been done to make the report better?

HOUSE DESIGN IN FOUR CLIMATES

Total time: 2 hours

Objectives:

- To compare and contrast indigenous house design in the four basic climatic zones of the world
- To design a house for one of the four climates

Resources:

- Rudofsky, Architecture without Architects
- Wright, Natural Solar Architecture
- Wright, Writings and Buildings
- Olgyay, Design with Climate

Materials: Newsprint, felt-tip pens, notebooks, pens or pencils

Procedures: Step 1. (5 minutes)
Present the objectives and describe the session activities.

Step 2. (20 minutes)
List the four basic climates of the world and brainstorm a list of characteristics of indigenous house or building design for each of the climates.

Trainer Notes

The four climates are:

- Hot Humid (i.e., Miami, Florida; Monrovia, Liberia)
- Hot Arid (i.e., Phoenix, Arizona; Ouagadugu, Upper Volta)
- Temperate (i.e., New York, New York; Santiago, Chile)
- Cool (i.e., Grand Rapids, Michigan LaPaz, Bolivia)

Ask if any of the participants have lived in the cities listed by each climate.

Have participants name characteristics of indigenous architecture for each one of the climates. Variables would include: type of construction, materials, insulation, ventilation, solar heating, shading, natural cooling, vegetation, etc.

Step 3. (30 minutes)
Ask the participants to form four small groups and have each group design a house (floor plan and elevation or perspective drawings) for one of the four climates listed on the newsprint.

Trainer Notes

Circulate among the groups and help with design, drawing, discussion, etc.

Step 4. (45 minutes)
Reconvene the groups and have a representative from each one present their house design.

Trainer Notes

Briefly discuss each design at the end of each presentation.

Step 5. (20 minutes)
Conclude the session by comparing and contrasting the different designs.

Trainer Notes

* Discuss the difficulty of designing a house in only 30 minutes.

* Refer the participants to the texts listed under "Resources."

* Ask the group, "If you have the opportunity to build your own house in-country, how would it differ (if at all) from existing local homes in the U. S.?

PRESENTATION OF SOLAR WATER HEATERS

Total time: 4 hours

Objectives:
- * To give a presentation explaining the design, construction and applicability of a solar water heater
- * To demonstrate effective facilitation skills and non-formal education techniques
- * To evaluate the solar water heater phase

Resources: Pett, Audiovisual Communication Handbook

Materials: As needed by each presentation group

Trainer Notes

Four hours of preparation time was allotted for these presentations in Phase IV: Session 10.

Procedures: Step 1. (5 minutes)
Review the session objectives and procedures.

Step 2. (20 minutes)
Explain the basic format for each presentation and give participants a few minutes to decide among themselves how they will give the presentations.

Trainer Notes

You should point out that prior to beginning the presentations, it will be necessary to establish an order in which the presentations will occur, set time limits, allot time at the end of each presentation for questions and feedback and name a timekeeper.

Explain that the basic format for each presentation should be:

- * To set up any necessary materials, devices, visual aids, etc.
- * To explain to the audience the role that they should be assuming, e.g., villagers, university professors, host country agency representatives, Peace Corps trainees, etc.
- * To give the presentation
- * To ask for questions or further clarification
- * To ask for feedback regarding NFE techniques and facilitation skills.

Step 3. (3 hours, 10 minutes)
Have each group give their presentation.

Trainer Notes

The feedback activity at the end of each presentation is important because it will help participants improve their skills at facilitating presentations. You should provide some focus for this portion of each presentation by asking the following questions:

- What did you think was the most effective part of the presentation? The least?
- What NFE techniques were used?
- Was the audience invited to participate?
- Do you think the presentation was clear?
- Could it be used in a village setting in the Third World?
- What are some examples of effective facilitation skills that were demonstrated?
- What could have been done to make the presentation better?

Step 4. (25 minutes)
Have the participants regroup and give feedback regarding the overall solar water heater phase.

Trainer Notes

You should center this discussion around some of the following questions:

- Were all or most of the phase's objectives met?
- What was the most important thing each participant learned during the phase?
- What did you like the least about the phase?
- How did the group dynamics work during the phase?
- How were problems solved during the design and construction sessions?
- Did the problem-solving change during the phase?
- What do people think of solar water heating as an appropriate technology?

PHASE V: SOLAR AGRICULTURAL DRYERS

Health and Nutrition

The Role of the Volunteer in Development

PHASE V CALENDAR - Page 1

	DAY 1	DAY 2	DAY 3
A.M.	SESSION 1: Introduction to Agricultural Dryers (Skill Area I) SESSION 2: Tour of Solar Dryers (I)	SESSION 5: Review of Existing Solar Dryer Plans (I) SESSION 6: Smoke Testing Solar Dryers (IV & V)	SESSION 8: Design of Solar Agricultural Dryers (III)
P.M.	SESSION 3: Solar Agricultural Dryer Design Procedures and Rules of Thumb (III) SESSION 4: Two-Hour Dryer Construction (IV)	SESSION 7: New Technologies: Introducing Solar Dryers (I & II) Independent Study	SESSION 9: Site Selection and Preparation (III) SESSION 10: Construction of Solar Agricultural Dryers (IV)

	DAY 4	DAY 5	DAY 6
A.M.	Construction (continued)	Construction (continued)	SESSION 12: Natural Cooling (III) SESSION 13: Approaches to Health Systems (III)
P.M.	Construction (continued)	SESSION 11: Issues and Methods in Development and Diffusion of Appropriate Technology (IV)	

PHASE V CALENDAR - Page 2

	DAY 7	DAY 8	DAY 9
A.M.	SESSION 14: Nutritional Gardening (I)	SESSION 16 CPR (I)	Independent Study Presentation Time SESSION 18: Introduction to Cost Benefit Analysis (IV & V)
P.M.	Construction (continued) SESSION 15: Practical Drying Tips (IV)	SESSION 17: Dryer Assessment and Modification (V)	SESSION 19: Presentation of Solar Dryers (III) SESSION 20: Introduction to the Final Phase of the Training Program (III)

INTRODUCTION TO AGRICULTURAL DRYERS

Total time: 3 hours

Objectives:

* To discuss the phase schedule
* To compare and contrast food storage techniques
* To discuss solar agricultural food drying as a potentially appropriate technology
* To discuss relationships between food storage and culture

Resources:

* Attachment V-1, "The Potential of Solar Agricultural Dryers in Developing Areas"
* Farallones, "Solar Agricultural Dryers Slide Show"
* Brace Research Institute, A Survey of Solar Agricultural Dryers
* ISES, "Sunworld," 1980 Vol. IV, No. 6, pp. 180, 181

Materials: Slide projector, screen, notebooks, pens, pencils, newsprint and felt-tip pens

Procedures:

Trainer Notes

> This session requires considerable preparation in setting up the slide show, copying the attachment and putting the phase schedule on newsprint.

Step 1. (5 minutes)
Present the objectives and outline the session activities.

Step 2. (15 minutes)
Present and discuss the phase schedule.

Trainer Notes

> Make changes in the schedule to meet the participants' needs. Be flexible.

Step 3. (20 minutes)
Have the participants form small groups and brainstorm a list of global food storage and preservation techniques.

Trainer Notes

Circulate among the groups to offer suggestions.

Step 4. (40 minutes)
Reconvene the groups. Post, review and discuss the list of food storage and preservation techniques.

Trainer Notes

Discussion should address the changes in food storage techniques throughout history, the economic and political connection to those changes and the similarities and differences in food storage techniques in the United States and abroad. Specific points for discussion are:

* Increased availability and desirability of high-technology methods and materials
* Increased availability of non-seasonal foods
* Larger urban populations and rural migration to the cities
* Less time for home preservation and storage
* More rapid transportation and communication systems
* Economic growth
* Higher crop yields
* Increased use of preservations and additives as a result of the growing food "industry"
* More sophisticated refrigeration methods
* Perception of food as a commodity, instead of a nutrient

Step 5. (10 minutes)
Distribute Attachment V-1 and have the participants read it.

Step 6. (20 minutes)
Briefly discuss the history, development and use of agricultural drying throughout the world and the possible use of solar agricultural dryers as potentially appropriate technologies.

Trainer Notes

Consult the resources listed in this session and those in the bibliography for background information.

Step 7. (10 minutes)
Explain solar agricultural dryer nomenclature and the food drying microclimate.

Trainer Notes

* Sketch section and perspective views of a generic dryer and ask people to help label the parts: drying chamber, trays, solar pre-heater, solar chimney, glazing, insulation, etc.

* Sketch a typical seed to demonstrate how drying occurs. (The participants have already discussed the three types of heat transfer (Phase II: Session 7 and Phase II: Session 16) and can help note where each type of heat transfer occurs in the seed.)

Step 8. (10 minutes)
Break.

Step 9. (45 minutes)
Present the Farallones Solar Agricultural Dryer slide show.

Trainer Notes

During the slide show, comment on both the technical details and the socio-economic aspects of the solar dryers.

Step 10. (20 minutes)
Discuss the potential impact of a new preservation and storage technology, such as solar agricultural dryers, on people in developing countries.

Trainer Notes

Points to consider are:

- Who is likely to build the dryer?
- Who is likely to use the dryer?
- Will there be any conflict between the builder and the user?
- How can the technology be readily accepted?
- Should dryers be small- or large-scale?
- Who is likely to pay for a dryer?

Step 11. (10 minutes)
Review and evaluate the session.

Trainer Notes

Distribute a file card (3" x 5" or 7.5cm x 12.5cm) to each participant and ask for an evaluation of the session:

- What went well
- What didn't go well
- How the session could have been better

When the cards are filled out, ask participants to share their comments.

THE POTENTIAL OF SOLAR AGRICULTURAL DRYERS IN DEVELOPING AREAS

Presented to the UNIDO Conference
Vienna, Austria
February 14-18, 1977
by

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Introduction

One of the oldest uses of solar energy since the dawn of civilization has been the drying and preservation of agricultural surpluses. The methods used are simple and often crude but reasonably effective. Basically, crops are spread on the ground or platforms, often with no pre-treatment, and are turned regularly until sufficiently dried so that they can be stored for later consumption. Generally little capital is required on the expenditure of equipment but the process is labor intensive.

There is probably no accurate estimate of the vast amounts of material dried using these traditional techniques. Suffice it to say it is a widespread technology practiced in almost every country of the globe and at nearly every latitude. Diverse products such as fruit, vegetables, cereals and grains, skins, hides, meat and fish and tobacco are dried using these simple techniques.

These technologies have originated in many of the developing countries so there is no major social problem in their acceptance or in the use by the local popoulations of dehydrated foods for consumption. There are several technical problems, however, with the process. They are:

- Intermittent, affected by cloudiness and rain
- Subject to insect infestation
- Affected by high levels of dust and atmospheric pollution
- Affected by the intrusion from animals and man

In the more advanced segment of the society, whether in developing areas or in industrialized regions, artificial drying has in many cases surplanted traditional sun drying in order to achieve better quality control, reduce spoilage and in general cut down on the losses and inefficiencies engendered by the above difficulties.

The relatively high cost of labor in most industrialized areas and the hitherto, until recently, inexpensive costs of fossil fuels permitted the development of the artificial, generally large scale, drying processes to be evolved. The cost of dehydration was added to the cost of selling the process materials. The advent of higher charges for fossil fuels as well as the danger of depletion and scarcity of these fuels has stimulated renewed interest in solar agricultural dryers.

It is estimated according to the FAO World Book that the amount of agricultural produce dehydrated in 1968 using solar energy amounted to 225 million tons. In that year alone, Australia exported over 72 thousand tons of sun-dried foods worth over 27 million dollars. If all this drying, or even part of it, were to be done using fossil fuels, it would put an even greater strain on our already limited reserves. Over the past three decades, increasing interest has been paid to the development of solar agricultural dryers which make use of known principles of heliotechnology in order to combat some of the principal disadvantages of classical sun drying.

In evaluating technologies which might be amenable to applications in developing areas, one should distinguish between small and large scale operations. In general, small scale systems would be used in those areas where land holdings are not large, with the result that individual farmers, fishermen and herdsmen only produce modest amounts of surplus products. The objective is to dehydrate these surpluses for use often only by the family of the producer or for sale in the local market in the immediate vicinity. At times, small scale surpluses of certain products such as peanuts or rice are delivered to central facilities for processing, dehydration and eventual marketing. These systems are generally well established and require a fair degree of organization in the industry. In many instances, these amalgamated handling facilities do not exist. Therefore, in providing an overview of some of the technologies, one must differentiate between the existence of commercial and physical infra-structures within a given locality.

Larger scale systems invariably require the use of an external power source. Where conventional electric power supplies are available, reliable and not excessive in cost, it is logical to utilize these external sources for the operation of fans and blowers, vents and duct baffles in order to increase the efficiency and operating performance of a solar agricultural system. Some dryers are of the portable, powered type, wherein solar air heater collectors are fitted with electrically powered fans (this could be done using gasoline or diesel engines as well) and are taken directly to the areas of production for in-situ drying. Traditionally, this process was used with fossil fuel, often butane or propane gas, as the energy source. As the price of these systems increases, there has been a tendency to develop systems of this nature relying on solar energy to provide the bulk of the energy required for dehydration. In fact, in some instances, fossil fuels are used to supplement these solar collectors in order to maintain optimum operating conditions in a system partially operated by solar energy.

The other major category applicable for dehydration in the industrialized sectors of developed and developing nations, is to use the roof area of existing buildings as the solar collector, fitting the buildings with suitable blowers, ducts, collectors and often storage mechanisms. In the United States of America, a number of activities along these lines have been developed and interest has been generated in some of the prestigious industrial and academic institutions in the country. An example of this is the project funded by the United States government where solar energy is used as a substitute in dehydration for natural gas. This project is being undertaken by California Polytechnic University and TRW Systems. They indicate that the State of California alone produces annually over 450 million dollars in dried fruit and vegetables. Their system will no doubt become increasingly cost-effective as the cost of fossil fuels and the electricity generated by them continue to escalate. (Ref. Solar EM: *1976, October.) Another system receiving increasing interest in this field both in developed and the developing regions is the use of greenhouses to dehydrate surplus produce. This combined effect of drying and greenhouse operations has much validity and has to be examined for each particular set of circumstances. A number of studies have been undertaken in this regard for specialized crops. Finally, an older but certainly no less valid system has been the use of heat extracted from the underside of roofs. This has proven quite satisfactory in providing some dehydration potential in a number of applications. This is one of the oldest applications in solar agriculture drying.

Technical Characteristics of Solar Agricultural Dryers

There are two principal aspects of this process:

- The solar heating of the working fluid (generally air).
- The drying chamber wherein the heated air extracts moisture from the material to be dried.

The solar heating aspect can in turn be subdivided into two categories:

- Separate solar air heater collectors using natural or forced convection to preheat the ambient air and reduce its relative humidity.
- Direct, in situ heating of air which in turn directly dehydrates the produce.

The sun drying principles have been well described by Lof and others in earlier literature and in some instances are less well understood than commercial dehydration.

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* Solar Energy Magazine

A discussion of drying theory is beyond the scope of this paper but a few principles may be advantageously outlined here. These are particularly applicable to direct radiation drying, inasmuch as the principles involved in the drying of materials in various types of opaque enclosures by means of hot air, whether from a solar heater or some other type of heating unit, are well outlined in the drying literature. The first requirement is a transfer of heat to the surface of the moist material by conduction from heated surfaces in contact with the material, or by conduction and convection from adjacent air at temperatures substantially above that of the material being dried, or by radiation from surrounding hot surfaces or from the sun. Absorption of heat by the material supplies the energy necessary for vaporization of water from it, 590 calories per gram water evaporated. Water starts to vaporize from the surface of the moist material when the absorbed energy has increased the temperature enough for the water vapor pressure to exceed the partial pressure in the surrounding air. Steady state is achieved when the heat required for vaporization becomes equal to the rate of heat absorption from the surroundings.

To replenish the moisture removed from the surface, diffusion of water from the center to the surface of the drying material must take place. This may be a rapid or a slow process,depending upon the nature of the material being dried and upon its moisture content at any time. It may thus be the limiting rate in the drying operation, or if moisture diffusion is rapid, the rate of heat absorption on the surface or the rate of vaporization may be the controlling factor. In some very porous materials, vaporization may take place even below the apparent surface of the material, vapor then diffusing through pores in the solid.

In the case of direct radiation drying, part of the radiation may penetrate the material and be absorbed within the solid itself. Under such conditions, heat is generated inside the material as well as at the surface and thermal transfer in the solid is facilitated.

For economic reasons, maximum drying rates are usually desired. Product quality must be considered, however, and excessive temperatures must be avoided in many materials. In addition, because drying occurs at the surface, those materials which have a tendency to form hard, dry surfaces relatively impervious to liquid and vapor transfer must be dried at a rate sufficiently low to avoid this crust formation. Close control of heat transfer and vaporization rates, either by limiting the heat supply or by control of the humidity of the surrounding air, must be provided.

The drying of a product simply by permitting relatively dry air to circulate around it, without the use of any direct or indirect heat source, is known as adiabatic drying. The heat required for vaporizing the moisture is supplied by the air to the solid material, thereby reducing the air temperature while increasing its absolute and relative humidity. Because of the low heat capacity of air, in comparison with the high latent heat of vaporization of water, large volumes of air at reasonably low relative humidity must be used in this type of drying process. Air leaving the drier is nearly saturated with water at the wet-bulb temperature. The air supply, at its initial dry-bulb temperature,and humidity is thus cooled and humidified toward its wet-bulb temperature, while the moist solids in contact with this air approach the wet-bulb temperature also.

The foregoing generalization must be somewhat modified if the materials being dried are at all soluble in the water present. Fruits and other agricultural products contain salts and sugars which cause a lowering of the vapor pressure. The surface temperatures of these materials must therefore be higher than the wet-bulb temperature of the air in order for vaporization to take place. This means that the adiabatic drying of these solids requires air at lower relative humidities than do the materials having no solutes in the aqueous phase.

An important property of materials processed by direct radiation drying is their absorptivity for radiation. Fortunately, most solids have relatively high absorptivities but they may change as drying proceeds, the surfaces of the materials becoming less or sometimes more "black" during the process. Also, there may be changes in opacity of the surface of the materials which are partially transparent to some of the wave lengths in the spectrum of the radiant source.

The thermal conductivity of the material is also an important property, particularly if the solids are dried in a layer of sufficient depth to require conduction of heat from particle to particle. If the thermal conductivity is poor, circulation of heated air through and between the particles of moist solid would permit better heat transfer than direct radiation on the surface of a relatively deep bed of particles.

In larger scaled dehydration systems, forced convection, generally powered with an external, non-renewable power source, increases the diffusion transfer of moisture and, if properly applied, increases the rate of dehydration and the quality of the produce. These systems are well documented in the literature.

TOUR OF SOLAR DRYERS

Total time: 1 hour

Objective: To examine and discuss existing solar dryers

Materials: A variety of solar dryers, a bee smoker or other smoke source and dried fruit or vegetables

Trainer Notes

The following preparation will be necessary for this session:

* Construct a variety of solar dryers to be used as samples.
* If there are dryers already available, arrange and repair them so that they can be demonstrated efficiently.
* Put some food into the dryers one or two days in advance so that participants can see how the dryers work.

Procedures: Step 1. (5 minutes)
Review the session objective and activity.

Step 2. (55 minutes)
Demonstrate and explain each of the sample solar agricultural dryers that are available.

Trainer Notes

* Encourage questions, comments and discussion.
* Have the participants examine each dryer carefully. Discuss how each one works, their pros and cons, etc.
* Have some dried fruit or vegetables to distribute for tasting.
* If it is a sunny day, blow smoke into the dryers and have participants note the air flow pattern and rate.

SOLAR AGRICULTURAL DRYER DESIGN PROCEDURES AND RULES OF THUMB

Total time: 2 hours

Objectives:

- * To examine and discuss the technical design procedures for solar dryers
- * To review and discuss the rules of thumb for solar dryer design

Resources:

- * Attachment V-3-A, "Technical Design Information for Solar Dryers"
- * Attachment V-3-B, "The Psychrometric Chart"
- * Attachment V-3-C, "Design Rules of Thumb for Solar Dryers"
- * ISES, "Sunworld," 1980, Vol. 1/No. 6, pp.180-81

Materials: Thermometer, gauze, rubberbands, string, newsprint and felt-tip pens

Procedures: Step 1. (5 minutes)
Present the objectives and outline the activities.

Step 2. (1 hour)
Distribute Attachment V-3-A. Review and discuss the attachment and the key variables in dryer design.

Trainer Notes

Post and review the following key variables in solar dryer design:

- * Vent Area - the area, in square centimeters, of the lower (intake) or upper (exhaust) vent, whichever is smaller
- * Solar Gain - the amount of solar heat being absorbed by the collector, in Kgcal/hr (found by multiplying the hourly insolation rate, given in Kgcal/m^2 hr, by the aperture or area of the solar collector, given in m^2)
- * Height - the distance between the top of the lower vent and the bottom of the upper vent
- * Change in Temperature (Δt) - the difference, in degrees centigrade, between the exhaust air temperature (or the maximum allowable temperature for the agricultural product) and the ambient, or inlet, air temperature

Continued

Trainer Notes/Continued

Guide the participants through the formulas in the attachment, encouraging their questions and comments.

Ask how each formula is applied to dryer design.

Explain to those people who are having trouble with the mathematics that you will be discussing more general rules of thumb for these same mathematical formulas and that it is not necessary to understand mathematics to design successful solar dryers.

Step 3. (20 minutes)
Distribute Attachment V-3-B and have the participants read and discuss it. Fashion a simple sling psychrometer and demonstrate its use.

Trainer Notes

* Explain wet and dry bulb temperatures and the psychrometric chart.

* To fashion the sling psychrometer, fasten wet gauze to the bulb of a thermometer, tie it to a cord, and twirl the thermometer at the end of the cord.

* Review the psychrometric chart,Attachment V-3-B.

* Explain that the chart can be used anywhere in the world.

* Demonstrate how the chart can be used to diagram what happens during the drying process (See Section F, Attachment V-3-A).

Step 4. (20 minutes)
Distribute and review Attachment V-3-C, "Design Rules of Thumb for Solar Dryers."

Trainer Notes

Explain that in order to design a successful solar dryer, you only need to understand the rules of thumb and the interaction of the key variables in dryer design.

Step 5. (15 minutes)
Review and discuss the session activities and objectives.

Trainer Notes

- Explain that the participants now have the necessary technical information for solar dryer design.
- Explain that they will have an opportunity to use this technical information when they design their solar dryers.
- Encourage the participants to think how this information might be communicated to people with little or no formal education.

TECHNICAL DESIGN INFORMATION FOR SOLAR DRYERS

A. How to find percent moisture content (wet basis):

$$M = \frac{100\,(w-d)}{w}$$

Where:

M = percent moisture

w = weight of wet sample

d = weight of dry sample*

*dry = oven dried, 222°C (450°F) for 48 hours

Example:

10 kg of fresh fruit which weigh 6 kg when dry.

$w = 10$ kg

$d = 6$ kg

$$M = \frac{100\,(10-6)}{10} = \frac{100\,(4)}{10} = 40\%$$

B. Energy Balance for Drying

The Energy Balance is an equation which expresses the following idea mathematically:

> The energy available from the quantity and temperature of air going through the dryer should be equal to the energy needed to evaporate the amount of water to be removed from the crop.

The formula is: $m_a \, C_p \, (T_i - T_f) = m_w L$

Where:

m_a = mass (or weight) of drying air

C_p = specific heat capacity of the air (i.e., how much heat it holds per degree of temperature rise)

T_i = initial temperature

T_f = final temperature

L = Latent heat of vaporization of water from grain (amount of heat needed to vaporize each unit of water)

m_w = mass (or weight) of water to be removed by evaporation

NOTE:
The task in solar dryer design is to figure and then achieve high enough temperatures (T_f) and air flow to remove the specified amount of water (m_w).

C. How to figure how much water (m_w) must be removed from your crop:

The formula:

$$m_w = \frac{W_1 (M_i - M_f)}{100-M_f}$$

M_w = mass (weight of water to be removed

w_i = initial mass (weight) of crop to be dried

M_i & M_f = initial and desired final % moisture of the crop

Example:

How much water must be removed from 100 kg of groundnuts in reducing from initial moisture of 26% to final moisture of 14%?

Substituting:

$$m_w = \frac{100 \text{ kg } (26 - 14)}{100 - 14}$$

$$= \frac{100 \times 12}{86}$$

$$\cong 14.0 \text{ kg}$$

D. Two Constants:

Latent heat of vaporization of water (L):

Amount of energy needed to vaporize (evaporate) each unit (gram, pound, etc.) of water from the crop.

For free water (in open pan), it's about 2,400 KJ*/kg
For water from crops, it's more and varies a bit with temperature and moisture content: 2,800 KJ/kg.

Specific heat capacity of air (C_p):

Amount of heat air can hold per degree of its temperature rise.

Varies a bit with humidity and temperature.
For this, use: 1.02 KJ/Kg° C

Example: How much heat is given up if the temperature of 3 kg of air drops from 40 to 35° C?

$$= 1.02 \text{ KJ} \times 3 \text{ kg} \times (40-35^\circ)$$

$$= 1.02 \ (3 \times 5)$$

$$= 15.3 \text{ KJ}$$

---

* KJ = kilo joules
1 KJ = 1 BTU or 1/4 Kcal

E. How to figure volume (V) of air from weight:

Air is usually quantified as volume at atmospheric pressure (P) and temperature (t).

The formula: $PV = m_a R_t$

Where:

P = Pressure (in kilopascals - kPa)

V = Volume (m^3)

t = temperature (degrees kilvin)

m_a = the mass (weight of air)

R = A constant factor, it equals about 0.291 kPa m^3/kgk under dryer conditions

> The Rule of Thumb is:
>
> 1 kg air at 35°C and normal pressure = 0.9 m^3
>
> or use psychrometric chart

* * *

Useful Solar Dryer Formulae:

$$\text{Air Flow } (m^3/\text{min}) = 4 \times \text{vent area } (m^2) \times \sqrt{\text{Height } (m) \times \Delta t \; (^\circ C)}$$

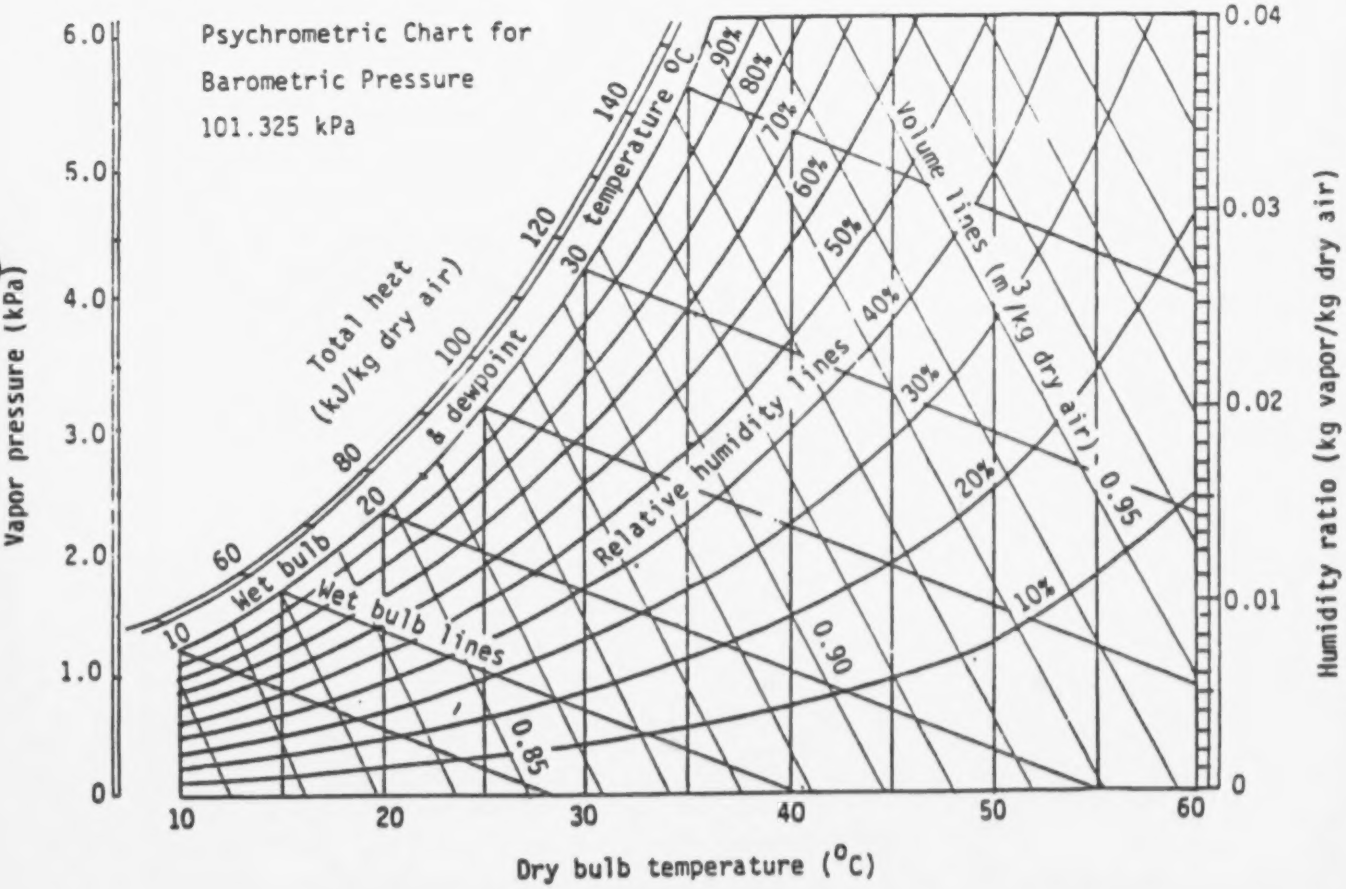
$$\text{Air Flow } (m^3/\text{min}) = .0004 \times \text{vent area } (cm^2) \times \sqrt{\text{Height } (m) \times \Delta t (^\circ C)}$$

$$\text{Vent Area } (cm^2) = \frac{\text{hourly insolation } (\text{Kgcal}/m^2 \text{ hr}) \times \text{Aperture } (m^2)}{.01 \sqrt{\text{Height } (m) \times \Delta t \; (^\circ C)} \times \Delta t \; (^\circ C)}$$

THE PSYCHROMETRIC CHART

The upper curve of the chart is for saturated air and is labelled wet-bulb and dewpoint temperature. (The word "dewpoint" arose from the observation that dew forms on grass when the grass cools, by radiaiton to the sky, to a temperature equal to or less than the wet-bulb temperature of the air above it.)

The other curves on the psychrometric chart that are similar in shape to the wet-bulb line are lines of constant relative humidity (in %). By definition, relative humidity is a ratio: the partial pressure of the water vapor at a given temperature ÷ the saturation pressure of the water vapor at the same temperature. The scale at the left side of the chart gives the pressures.



The straight lines sloping gently downward to the right are lines of constant wet-bulb temperatures. The intersection of a dry-bulb and a wet-bulb line gives the state of the air for a given moisture content and relative humidity. The lines of constant wet-bulb temperature also give values of constant enthalpy (total heat content), measured in heat units per unit weight of dry air.

Other lines sloping more steeply to the right give the specific volume of dry air, the volume occupied by one kilogram of dry air under the indicated conditions.

In examining a psychrometric chart, note that:

* Processes in which air is heated or cooled without change in moisture content give horizontal lines. Heating along such lines will decrease the relative humidity, while cooling will increase it.

* The wet-bulb temperature lines, sloping downward to the right, are lines of adiabatic cooling (where there is no change in heat content). These lines typify drying processes in which air is passed over the surface of wet material and is cooled by evaporation of water from the material. Lines of constant total heat parallel these wet-bulb lines.

* Although no processes follow the lines giving the specific volume of dry air, these lines show that at any given dry-bulb temperature, the density of air decreases as either the temperature or the relative humidity rises.

DESIGN RULES OF THUMB FOR SOLAR DRYERS

A. Assorted considerations for solar agricultural dryer designs:

- 1 kg of air at 35°C $\cong$ 0.9 m^3
- For grain drying, make beds no more than 15cm thick, giving a maximum loading rate of 90kg/M^2 (requires stirring).
- Tropical-monsoon insolation of 5-25 MJ*/M^2 per day.

  Use 15 MJ/M^2 per day for estimate (approximately 14,000 BTUs or 3,500 kcal).
- Typical conservative day long efficiency of stationary collection: -25%

  (That is, the energy delivered as heated air to the drying crop is 25% of the energy in the sunlight striking a horizontal surface of equal area to the dryer's collector.)

B. Collector size:

Making the collector equal to three times the tray area gives a high drying rate dryer.

C. Dryer capacity:

In the tropics, figure on about 180 M^3 of air to remove 1 kg of water.

Figure about 3/4 M^2 of collector area to remove 1 kg of water per day (i.e., dry 1.5 kg fresh fruits or 5.25 kg grain per day).

D. Dryer temperature:

1. Depends upon insolation, collection area and vent size.
2. Is very sensitive to vent size (cutting vent size by one half increases Δt by about three times (up to some limit).
3. Doubling area of collector increases Δt by about one half.
4. Raising temperature from 20 to 35°C can triple the water capacity of the air.

* MJ = Mega Joule or 1 million joules.

E. Dryer air flow rate:

1. Doubling vent area doubles the air flow rate (but drops Δt by about 3/4).
2. Doubling height increases air flow by 0.4.
3. Doubling collector area increases air flow by about 40% (also increases Δt by 1/2).

F. Required moisture contents of crops/approximate values:

	For Storage	Fresh
Fruits	10%	70 - 85%
Vegetables	18%	70 - 85%
Grains	14%	25 - 35%

G. Figuring how much air you need for drying:

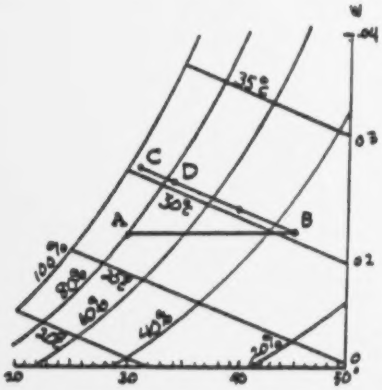
There are two methods: using the psychrometric chart or using the energy balance equation.

Method #1. Using the Psychrometric Chart

Example:

You want to dry 1 kg. of rice from initial moisture of 22% to final moisture of 14%. Assume ambient air temperature is 30°C at 80% humidity and you pre-heat the air to 45° for drying.

The path A-B represents the heating process. Note that in moving the temperature to B, the humidity drops to 35%.



The path B-C represents the change in the air as it passes through the dryer, cooling and picking up moisture from the rice. Initially (because rice is quite wet), air gets to C. At the end of the process, it only reaches D. As the rice gets dryer, you find points C & D from the table* of equiibrium moisture contents (it's similar for all crops). In this case, the air's humidity ratio rose by about 0.005. (That's how much water the air carried away.)

*See table, next page.

Equilibrium moisture content of rough rice, per cent wet basis.*

Temperature (^oC)	Relative humidity of air (%) 20	30	40	50	60	70	80	90
10	8	9	11	12	13	14	16	19
20	7	9	10	11	13	14	15	18
30	7	8	9	11	12	13	15	17
40	6	7	8	10	11	12	14	17

* Moisture level at which rice will stabilize if exposed to the specified temperatures and humidity conditions.

The amount of water to be extracted from 1 kg of rice in this case can be figured using the equation found in Part C of Attachment A, page 2.

$$M_w = \frac{W_1 \ (M_i - M_f)}{100 - M_f} = \frac{1 \text{ kg } (22\% - 14\%)}{100 - 14\%} = 0.093 \text{ kg}$$

From the definition of humidity ratio (weight of water vapor in the air ÷ the weight of dry gases in the same air), it follows that the mass of air needed (m_a) in this case, where humidity ratio rose by 0.005, is:

$$\frac{0.093}{0.005} = 18.6 \text{ kg of air} = m_a$$

We can transform this weight to volume with the equation from Part E of Attachment A: $PV = m_a RT$

When $P = 101.3$ (normal sea level)

$T = 308$ (35^oC)

$$\text{Then } V = \frac{m_a RT}{P} = \frac{18.6 \times .291 \times 308}{101.3} = 16.5 \text{ m}^3$$

Method #2. Using Energy Balance Equation (See Example)

We have calculated above that the amount of water to be removed (M_w) = 0.093 kg.

We know the two constants:

1. Latent heat of vaporization (L) = 2,800 KJ/kg
2. Specific heat of air (C_p) = 1.02 KJ/kg^{o}C

Assuming initial temperature (T_i) = 45°C and final temperature is a mean value of 32°C, we can substitute in the energy balance equation to get m_a:

$$m_a = \frac{m_w L}{C_p(T_i - T_f)} = \frac{0.093 \cdot 2{,}800}{1.02\ (45-32)} = 19.6 \text{ (kg of air)}$$

We can transfer that to M^3 using our rule of thumb (1 kg $\cong$ 0.9 M^3) or $PV = M_a RT$ and we get about 17.3 M^3 of air.

You will notice that this result is not identical to the 16.5 M^3 calculated above using the psychrometric chart. However, the result is close enough for design work.

H. To figure air flow rate:

Example:

Say we want to dry 1,000 kg of rice.
We've figured it takes 17 M^3/kg, so that's 17,000 M^3 total.
If we want this to flow in 30 hours (say, four 7-1/2 hour solar days), that's:

$$\frac{17{,}000}{30} \quad \text{or} \quad 566\text{-}2/3\ M^3/\text{hr.} \quad \text{or} \quad 9.44\ M^3/\text{min.}$$

I. To figure area of solar collector needed:

You must determine:

1. Mass of water to be evaporated (M_w)
2. Specific latent heat of vaporization of water from the crops (L) = 2,800 KJ/kg
3. The quantity (Q) of insolation per unit horizontal area per day
4. The efficiency at the collector (ε)

Example:

For 1,000 kgs. of rice, we calculated that we must remove 93 kg. of water. We know L = 2,800 KJ/kg. So the heat required is 93 x 2,800 = 260,400 KJ (260.4 MJ)*

This heat must come from the available solar energy.

* MJ = Megajoule (1,000,000 joules or 1,000 kilojoules)

Tropical monsoon insolation is highly variable, depending upon cloudiness: from 5 to 25 MJ/M^2 per day.

Use 15 MJ/M^2 per day as a conservative average in absence of data.

Assuming 15 MJ/M^2 per day and 25% efficiency of the collector yields 3.75 MJ/M^2 per day or 15 MJ/M^2 in four days.

So, the total area of collector required is:

$$\frac{\text{Total Energy Required}}{\text{Energy}/M^2 \text{ of Collector}} = \frac{260.4\ MJ}{15\ MJ/M^2} \cong 17.5\ M^2$$

J. How to figure vent area, using two methods:

Method #1:

If you have the required flow rate figured (See Section H.), use this formula:

$$\text{Vent Area } (CM^2) = \frac{\text{Air Flow } (M^3/\text{min})}{\sqrt{.0004}\ \overline{\text{Height (M)}} \times \Delta t\ (^{\circ}C)}$$

Example:

Assume air flow calculations showed a flow rate of 9.4 M^3/min required to dry our 1,000 kg or rice in four days (review Section H.). Then checking data sources, assume that the desired temperature of the drying rice is 62°C and that the ambient temperature is 30°C. So delta temperature (change in air temperature in the dryer) is $62^{\circ} - 30^{\circ} = 32^{\circ}$. Assume a height of 4m for the dryer. Substitute in the equation:

$$\text{Vent Area } (CM^2) = \frac{9.4}{\sqrt{.0004}\ \overline{4 \times 32}} = 2077\ CM^2$$

Method #2:

If you have an aperture (collector) area and some idea of solar intensity, use this formula:

$$\text{Vent Area } (CM^2) = \frac{\text{Hourly Insolation (kg cal}/M^2\text{ hr)} \times \text{Aperture}(M^2)}{.01\ \Delta t\ \ \text{Ht (M)} \times \Delta t(^{\circ}C)}$$

Assume that a maximum of 15% of the total daily radiation falls in the hottest mid-day hour. This is $0.15 \times 25\ MJ = 3.75\ MJ/hr\ M^2 = 896\ Kcal/hr.\ m^2$ *

Using the aperture area found in Section I, it's 17.5 m^2. Let $\Delta t = 32^{\circ}C$ and $h = 4M$ as above.

* $1\ MJ/m^2 = 239\ Kcal/m^2 = 88\ BTu/m^2$

Always assume a high insolation rate so your vents will be large enough to prevent over-heating, even under the most intense sun conditions. You can always close the vent to some degree, if necessary.

Then, substituting the formula:

$$\frac{896\ \text{Kcal/M}^2\ \text{hr} \times 17.5\ \text{M}^2}{.01 \times 32^{\circ}\text{C}\sqrt{4(\text{M}) \times 32}\ (^{\circ}\text{C})} = 4331\ \text{CM}^2$$

Note: This is the maximum vent area you would ever need. With a lower insolation rate of 15 MJ/day, the vent area could be cut down to about 2,600 CM^2.

TWO-HOUR DRYER CONSTRUCTION

Total time: 2 hours

Objectives:

- To construct a simple solar agricultural dryer
- To discuss group dynamics and problem-solving methods

Materials: Paper, pencils, cardboard (boxes and sheets), tape, plastic glazing (polyethylene, polyvinylchloride, etc), staple guns, staples, string, wire, small dimension lumber, small nails, hammers, saws, knives, black paint, window screen, and other simple solar dryer construction materials

Procedures: Step 1. (5 minutes)
State the objectives and outline the session activities.

Step 2. (1 hour, 30 minutes)
Form work groups and construct a solar agricultural dryer.

Trainer Notes

- Note that these work groups will be the same work groups for the larger solar dryers to be built later.
- Emphasize that the dryer can be small, that it should be easily and quickly built and that it may incorporate some of the features covered in earlier sessions.
- Remind the participants that they have only two hours to build their solar dryer and it will be necessary to do just enough calculation to build the dryer without going through more detailed calculations.
- Note that much re-design will occur during the construction of the solar dryers.
- Circulate among the groups and offer assistance when necessary. Be careful not to offer too much help with the design/re-design and decision-making processes of the groups. Intervene only to correct unsafe tool use. Allow groups to learn from their mistakes.

Step 3. (10 minutes)
Have participants clean up the work area.

Step 4. (15 minutes)
Reconvene the group and conclude the session by reviewing and discussing how the groups worked together to construct their dryers.

Trainer Notes

- Encourage the participants to discuss the group dynamics and problem-solving methods used during this session. Focus this discussion by reviewing the processes of design, construction and re-design.
- Encourage the participants to put food in their solar dryers and begin experimental drying.
- Mention that these dryers will be used in Session 6.

REVIEW OF EXISTING SOLAR DRYER PLANS

Total time: 2 hours

Objectives:

* To identify and list criteria for evaluating solar dryer designs

* To evaluate solar dryer designs

Resources:

* Brace Research Institute, A Survey of Agricultural Dryers

* Ministry of Energy, Philippines, Proceedings of the Solar Drying Workshop

Materials: Newsprint and felt-tip pens, assorted solar dryer plans

Trainer Notes

To carry out this session, you will need to gather a large assortment of solar dryer plans. These can be found in the resource materials and in the publications listed in the bibliography.

Procedures:

Step 1. (5 minutes)
Review the objectives and outline the session activities.

Step 2. (20 minutes)
Have the participants brainstorm a list of criteria that can be used to evaluate solar dryers.

Trainer Notes

Add to the list by mentioning the following questions:

* Is the collector large enough to provide sufficient heat?
* Are the vents adjustable and/or large enough to allow adequate air flow?
* Can the collector tilt be built or adjusted for the specified latitude and time of year?
* Is the size adequate for the amount of material to be dried?
* Can the system be built efficiently and easily with low-cost materials?
* Is it weather and pest proof?
* Are there any design features that would make it impractical in the proposed socio-cultural setting?

Step 3. (10 minutes)
Distribute the various dryer plans and briefly explain them.

Step 4. (30 minutes)
Have the participants form their construction groups and evaluate the solar dryer plans according to the list developed in Step 2.

Trainer Notes

- Explain that each group should evaluate as many sets of plans as there are group members and that they should prepare to present their evaluations to the assembled groups.
- Distribute newsprint and felt-tip pens and encourage the groups to prepare graphic presentations.

Step 5. (50 minutes)
Reconvene the groups and have them give their presentations.

Trainer Notes

- Explain that each group member should give a brief presentation of a device.
- Encourage questions, comments and discussion at the end of each presentation.

Step 6. (5 minutes)
Conclude the session by noting that a large variety of solar dryer designs have been reviewed and that this experience will be useful when they design their own solar dryers.

Trainer Notes

Remind the participants to keep the list of criteria that was developed in this session and use it when they design their dryers.

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SMOKE TESTING SOLAR DRYERS

Total time: 2 hours

Objectives:

- To design and carry out experiments to determine the air flow through solar dryers
- To discuss the effects of vent size, chimney height, temperature and convective air flow on dryer design

Resources:

- Attachment V-6-A, "Guidelines for Two-Hour Dryer Experiment"
- Attachment V-6-B, "Data Collection Sheet"

Materials: Thermometers, stopwatch or wristwatch, smoke source (bee smoker, cigar, etc.), two-hour solar dryers (from Session 4)

Procedures: Step 1. (5 minutes)
Present the session objectives and outline the activities.

Step 2. (10 minutes)
Distribute and review Attachments V-6-A and V-6-B.

Step 3. (55 minutes)
Have the participants form their construction groups, design and carry out the smoke test experiments on their two-hour dryers.

Trainer Notes

- Emphasize the need to determine objectives for the experiments.
- Stress the importance of repeating each experiment several times to average the effects of uncontrolled variables, such as a breeze or a passing cloud.
- Explain that they will be presenting their experiment and its results later in the session.
- Have the groups chart their experiment results on a graph.

Step 3. (15 minutes)
Have the groups prepare their graphs and presentations.

Step 4. (20 minutes)
Have the groups give their presentations.

Trainer Notes

After each presentation, encourage questions and discussion about how vent size, chimney size, temperature and convective air flow affect dryer design.

Step 5. (15 minutes)
Conclude the session by having the participants identify general conclusions which can be drawn from their experiments.

Trainer Notes

You should point out that the conclusions from these experiments will be useful later in the phase when participants are designing and building their solar dryers.

GUIDELINES FOR TWO-HOUR DRYER EXPERIMENTS

The two-hour solar dryers illustrate the variables involved in the design of solar dryers: vent size, vertical height (measured between air vents), temperature and convective air flow. The flow may be measured by releasing into the cylinder light, airborne matter, e.g., feathers, smoke or dust particles, and timing the ascent with a watch from the point of entry until the material emerges at the top. The volume of the cylinder, divided by the time elapsed, will indicate the estimated air flow.

Using a thermometer, the temperature is measured at the outlet, which is the hottest point. Two variables may be introduced to affect the air flow and temperature: the air vents may be left unobstructed or made progressively smaller by taping or otherwise blocking the opening; or the dryer may be tilted from horizontal (no flow) to vertical (maximum flow).

Through conducting such experiments, information is gained regarding the interrelationships of various factors -- venting, height, temperature and air flow. Examples of two experiments are:

1. Temperature and air flow are measured in one section of the dryer placed in various positions (including vertical and horizontal).

2. Temperature and air flow are measured after one, or both, ends of the dryer are partially closed, while it is in various degrees of tilt.

Guidelines for conducting the experiments:

1. Record all observations.
2. Attempt to be as accurate as possible.
3. Keep the dryer in the sun to avoid any cooling between experiments.
4. Maintain the dryer's position (either horizontal or vertical) so that it is as perpendicular to the sun as possible, in order to maximize insolation.
5. Keep track of the ambient air temperature.
6. Do not place the thermometer in direct sunlight.
7. Change only one variable at a time during the experiments, and maintain all other factors constant, e.g., record all temperatures and air flow data, changing only the vent size or the height, not both simultaneously.

If desired, graphs may be prepared to describe height vs. airflow, height vs. temperature, vent size vs. air flow or vent size vs. temperature. Data may be recorded on Attachment V-6-B, "Data Collection Sheet."

DATA COLLECTION SHEET

Ambient air temperature: 20°C

Model Description and Configuration	Air Flow (None, Low, High)	Outlet Air Temperature
One section, vertical		
Four sections, vertical		
One section, horizontal		
One section, 45° tilt, small inlet		
One section, vertical, small outlet		
Four sections, 60° tilt, small outlet		

INTRODUCING NEW TECHNOLOGIES: SOLAR DRYERS

Total time: 1 hour

Objectives:
- * To discuss factors which influence acceptance of new technologies (i.e., solar dryers)
- * To observe role-plays and discuss their effectiveness as techniques for community development

Resource: Crone, From the Field, pp. 69-70

Materials: Newsprint and felt-tip pens, other materials as needed by the participants

Trainer Notes

This session involves role-playing as its principal activity and requires planning. Select three or four volunteers from among the participants to help with this activity. If any of the participants have experience in a Third World country, encourage them to volunteer as this will lend authenticity to the situation. Arrange to meet with the role-players at least half an hour before the session to develop the role-play situation. Explain that the activity should center around factors which influence the acceptance of a new technology in a community (i.e., time, money, risks involved, disruption of traditional "ways of doing things," etc.). Allow the participants considerable latitude in developing the roles. Encourage them to be creative. Have them focus the play on the introduction of a solar-drying device into a Third World community. Make sure that they understand there is no need to offer solutions to any of the issues they raise. The purpose of the play is to stimulate thought and discussion among the observers.

Procedures: Step 1. (5 minutes)
Explain the session objectives and review the activities.

Step 2. (10 minutes)
Present the role-play situation.

Step 3. (30 minutes)
Have the participants identify and discuss the issues raised by the role-play concerning the acceptance of new technologies in a community.

Trainer Notes

To stimulate discussion, list the issues on newsprint as they are identified and ask participants to suggest ways of dealing with them.

Step 4. (15 minutes)
Have the participants discuss the effectiveness of role-play as a technique for community development.

Trainer Notes

- First, ask people to comment on the effectiveness of the role-play in helping to meet the objectives of this session.

- Then have them identify some ways in which they could use role-play techniques in their work as Peace Corps Volunteers.

DESIGN OF SOLAR AGRICULTURAL DRYERS

Total time: 5 hours

Objectives:

- To identify and list criteria for assessing a solar dryer design
- To calculate the cost of a solar dryer
- To design a solar dryer
- To evaluate problem-solving techniques used in the design process

Resources:

- Attachment V-8-A, "Solar Food Dehydration Guidelines"
- Attachment V-8-B, "Design Considerations for Solar Dryers"
- Attachment V-8-C, "Bibliography for Solar.."
- Materials Price List (see Trainer Notes)
- Procedures for developing final solar dryer designs (see Trainer Notes)

Trainer Notes

Part III of Attachment V-8-B is a sample materials price list. It can be used to give participants the data they will need to complete the cost problems outlined in Step 5. However, we recommend that you develop and distribute a price list that is more specific to your training program and area.

See Trainer Notes, Step 6, for the procedures for developing final solar dryer designs.

Materials: Newsprint, felt-tip pens, notebooks, graph paper, pens, pencils, rulers and architectural scales

Procedures: Step 1. (10 minutes)
Present the session objectives and outline the activities.

Step 2. (15 minutes)
Distribute and review Attachment V-8-A, "Solar Food Dehydration Guidelines." Encourage questions and comments.

Trainer Notes

Point out that this information is helpful in developing criteria for designing solar dryers.

Step 3. (20 minutes)
Have the participants form their construction groups and list on newsprint the criteria for assessing a solar dryer design.

Trainer Notes

Explain that there are many factors to be considered in developing the criteria lists.

Suggest the following considerations:

* Crop or crops to be dried
* Amounts to be dried
* Time of the year when harvest occurs
* Moisture of crop at harvest
* Acceptable moisture for storage
* Relative humidity of climatic zone
* Appropriate drying methods that retain nutrients and preserve freshness
* Design feasibility (Can it built within 30 hours and will it function efficiently?)
* Appropriate insulation where needed
* Proper aperture size and tilt
* Adequate venting area with room for adjustments
* Appropriate rack design for the specific crop to be dried
* Simplicity of construction (minimal need for high skill input)
* Type and availability of construction materials
* Durability
* Maintenance
* Percent of possible sunshine at harvest time

Have each group post their completed lists at the front of the room.

Step 4. (40 minutes)
Reconvene the groups and have each construction group present, discuss and modify their list.

Trainer Notes

Have each group explain their list, compare it with the other groups' lists and make any changes.

Each group should develop its own criteria list. However, it is probable that, after two or three groups have modified their lists, the lists will begin to be similar or the same. If this happens, point out that this activity is an example of a technique which can be used to help large groups reach a consensus.

Step 5. (35 minutes)
Distribute and review Attachments V-8-B, "Design Considerations for Solar Dryers, and V-8-C, "Bibliography of Solar Food Dehydration Publications."

Trainer Notes

When reviewing Part II of Attachment V-8-B ("Cost Analysis of Solar Dryers"), solve a sample cost problem with the participants. Then have them solve one on their own. Part III of Attachment 8-V-B can be used as data for completing the problems. If you have developed a price list that is more specific to your program, use it instead (see Trainer Notes under Resources).

Following this activity, allow participants the opportunity to take a short break.

Step 6. (15 minutes)
Post and explain the procedures and guidelines for developing the final solar dryer designs.

Trainer Notes

Post on newsprint the following procedures:

1. Develop preliminary designs (45 minutes)
2. Assess and modify preliminary designs (30 minutes)
3. Develop final designs (60 minutes)

Explain that in the next step, participants will return to their construction groups and follow the above procedures to develop their solar dryer designs. Stress the importance of keeping within the time limits for each procedure.

Explain the following guidelines:

* All designs should include materials lists, venting schemes, food racks, sketches, dimensions, etc.
* During the preliminary design period, groups should work together, sharing and discussing their ideas with one another. There should be an atmosphere of cooperation among the groups. They should work together to explore as many design ideas as possible and to help each other by offering constructive feedback.
* Each group should then work independently to assess its preliminary design.
* Each group should modify its preliminary design such that it meets the criteria developed earlier in the session.
* The final designs should be clear and easy to read.

Step 7. (2 hours, 15 minutes)
Have the participants return to their construction groups and develop their final solar dryer designs.

Trainer Notes

As the groups are working, circulate among them and offer help whenever it is necessary. Be careful not to intervene so much that you inhibit the participants' opportunity to solve their own problem creatively.

Approximately ten minutes before the end of the time period allotted for this step, visit each group and check their final designs for completeness.

Step 8. (25 minutes)
Reconvene the groups and have them discuss and evaluate the problem-solving techniques used in developing their designs.

Trainer Notes

Stimulate the discussion by asking the following questions:

* Was there a particular pattern to the problem-solving techniques used by your group?
* What technique was most effective for solving problems or reaching a consensus decision? Least effective?
* Do you think that your problem-solving skills were improved by this activity? How?
* What relevance do problem-solving skills have to your future work as Peace Corps Volunteers?
* Are you satisfied with you final designs?
* Do you feel that the design will work?
* Do you understand how the dryer will be constructed and how it will work?

Step 9. (5 minutes)
Conclude by reviewing the session objectives and reminding the participants that they will be building their solar dryers in the next session.

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SOLAR FOOD DEHYDRATION GUIDELINES

PRODUCE	AMOUNT OF FRESH MATERIAL PER TIME (IN A TEST DRYER)	OPTIMUM TEMPERATURE	MAXIMUM TEMPERATURE	LIGHT CONDITIONS*
Herbs, garlic, rosehips, parsley	6 lbs/ 2 days	42°C	60°C	Dark
Fruits, apricots apples, peaches	10 lbs/ 2 days	42°C	62°C	Light
Grapes	12 lbs/ 4 days	50°C	70°C	Light
Grains, wheat, rice barley, corn	5 lbs/ 3 days	62°C	70°C	Dark
Vegetables, okra, onions	7 lbs/ 2 days	50°C	62°C	Light
Carrots (A&E)	5 lbs/ 3 days	45°C	50°C	Dark
Mushrooms	7 lbs/ 2 days	38°C	70°C	Dark
Greens, spinach collards, endive	3 lbs/ 2 days	45°C	55°C	Light

* i.e., whether food is exposed directly to sunlight or only to sun.

SOLAR FOOD DEHYDRATOR DATA SHEET

Batch #________ Sample ________ Food Source ____________ Dehydrator Location ____________

Date	Time	Weight	Outside Temper.	Dryer Temp.	Outside Humidity	Sky Conditions	Tray Rotation	Comments

DESIGN CONSIDERATIONS FOR SOLAR DRYERS

I. Design Recommendations for Solar Food Dryers

If you have no other design data to go by, provide approximately 3 times the area of solar collector as drying tray area. This will allow enough heat to be collected to provide sufficiently quick drying at the appropriate drying temperature.

Try to get an air flow rate of 1/3 to 1/2 m^3 per minute per m^3 of dryer volume. This amount of air circulation should be obtainable with natural circulation, assuming the dryer is not overloaded.

Grains dry quickly (1 or 2 sunny days or 3 or 4 partly-sunny days) when the thickness of the grain is not too great. Research has shown that thicknesses over 15cm (6") of rice or corn requires a fan to force air through it. The thinner the layers of grain, the quicker the grain will dry.

Use a back-up heat source if the sun cannot be depended upon to shine for at least six straight hours. It is best to have the first drying day be a full, sunny day. If the first drying day is not sunny, it is best to provide back-up (supplemental) heat to assure a high-quality food.

Find the lifetime unit cost of the system, using the cost analysis formula given below. This figure will give the designer and the user a basis for comparison of several dryers or designs.

II. Cost Analysis of Solar Dryers

To find an appropriate cost-per-unit weight of a solar dryer, the following equation can be used:

$$\text{Lifetime cost per weight} = \frac{\text{T. L. C.}}{\text{L.D.} \times A \times L \times W \times Y}$$

where:

T.L.C. = Total Lifetime Cost
= Initial cost of solar system + cost of repair and maintenance of solar system for the lifetime of the system, considering the inflation rate + initial cost of the back-up system + cost of back-up fuel during the lifetime of the system

L.D. = Loading Density, given in weight per area of tray, i.e., lbs/ft^2, Kg/m^2, etc.

A = Area of trays, given in same unit as in L.D., i.e. ft^2, m^2, etc.

L = Number of loads per week, given in the conservative estimate of the number of times in a week the dryer will be loaded with fresh food.

W = Number of weeks per year the dryer will be used. This should be a conservative estimate of weeks per year that the dryer can possibly be used. This will depend upon the ripening of crops, the availability of crops, the climate, the weather, etc.

Y = Number of years the dryer will be functional. Give the conservative estimate of the life of the system, considering glazing material, the frame material, exterior material, screens, etc.

Example: Find the unit cost ($/kg) for a solar corn dryer assuming the following conditions:

The cost of the solar system is $30.00. The
The back-up system costs $10.00.
The cost of repair and maintenance is 1% per year, with inflation at 15%.
The cost of the back-up fuel for the life of the system (10 years) is $100.00.
The loading density is 8 kg/m^2.
The area of trays is 10 m^2.
1.5 loads can be put into the system every week.
The system is usable 30 weeks out of the year.
All materials should last 15 years.

Answer:

T. L. C. = $30.00 + $10.00 + $100.00 + $6.13 = $146.13

$$\$/\text{kg} = \frac{\$146.13}{8\,\frac{\text{kg}}{\text{m}^2} \times 10\,\frac{\text{m}^2}{\text{load}} \times 1.5\,\frac{\text{loads}}{\text{week}} \times 30\,\frac{\text{weeks}}{\text{year}} \times 15\text{ years}}$$

$$= \frac{\$146.13}{54{,}000\text{ kg}}$$

$$= \frac{\$\ 0.0027}{\text{kg}}$$

III. Materials Price List (Typical)

	3/4"	1/2"
Galvanized pipe per foot	$ .75	$ .50
Polyethylene pipe per foot	.40	.30
Valves	6.00	3.00
Hose bibs	3.00	2.00
Unions	2.00	1.50
Tees	.75	.70
Ells	.60	.50
Nipples per inch	.25	.20
	.50	.50

5 gallon tank, steel	5.00
5 gallon tin can	2.00
16 gallon tank	20.00
17 gallon drum with lid	10.00
30 gallon tank	40.00

	29.95	
Lumber	.40	per board foot
Plywood	.75	per square foot
Paint	2.00	per quart
Plastic (black or clear)	.10	per square foot
Glass (cut your own!)	2.00	per square foot
Cement	.15	per pound
Sand	.10	per pound
Metal	.50	per pound

BIBLIOGRAPHY OF SOLAR FOOD DEHYDRATING PUBLICATIONS

1. Proceedings of the Solar Drying Workshop, Manila, Philippines, October 18-21, 1978.
   Available from the Bureau of Energy Development, Ministry of Energy, Fort Bonifacio, Makita, Metro Manila, Philippines.

   The conference focused on solar food drying in the humid tropics regions of the world. Participants came from such countries as Indonesia, India, Malasia, Papua New Guinea, Philippines, Singapore and Thailand. It is a valuable publication for those who will be drying foods in the tropics.

2. Survey of Solar Agricultural Dryers, Technical Report T99, December 1975.
   Available from Brace Research Institute, MacDonald College of McGill University, Ste. Anne de Bellevue, Quebec, Canada H9X 3M1.

   The survey contains the history, use, plans and drawings of solar dryers from throughout the world. Especially of interest are the dryers which have been locally designed, built and used for a number of years. These dryers have proved to be useful and adaptable to those who have them. Much technical data and many drawings and plans.

3. Solar Food Dehydrator Plans ($6.50, plus shipping)
   Available from Solar Survival, Cherry Hill Road, Harrisville, New Hampshire 03450 USA

   The plans show how to build a very practical and flexible solar food dryer from common materials using simple tools. The plans include information on how to dry various fruits and vegetables, plus how to build and install a back-up heater for non-sunny periods.

4. How to Build a Solar Crop Dryer ($2.50, plus shipping)
   Available from the New Mexico Solar Energy Association
   P. O. Box 2004, Santa Fe, NM 87501 USA

   The booklet includes detailed, step-by-step drawings and procedures on how to build a solar dryer. The design was made to be used in sunny New Mexico (Latitude 35° North), so it may have limitations to use on a worldwide basis.

5. Drying Foods at Home (#2785) Free publication.
   Available from Agricultural Sciences Publications, University of California, 1422 Harbor Way South, Richmond, California 94804 USA

   This booklet includes excellent information on drying fruits and vegetables at home. It focuses on the mechanics of drying, but does not cover solar drying to any extent. However, the other material in the booklet is very good.

SITE SELECTION AND PREPARATION

Total time: 1 hour

Objectives:
- * To locate and prepare a site for a solar dryer
- * To identify and list criteria for selecting a site for a solar dryer

Resources: See Phase IV: Session 8, "Shade Mapping and Solar Siting"

Materials: See Phase IV: Session 8, shovels, hoes, rocks or blocks for foundations, newsprint and felt-tip pens

Procedures: Step 1. (5 minutes)
Present the session objectives and outline the activities.

Step 2. (15 minutes)
Have the participants list the basic criteria for the selection of a site for a solar dryer.

Trainer Notes

The list should include the following criterion:

- * Convenient and accessible, i.e., near the crop harvest, storage areas or home
- * Protected from wind, dust and excessive rain
- * In full sunlight during the time of year that the dryer will be used

Step 3. (45 minutes)
Have the participants form their construction groups and prepare the ground, clearing it of brush and scrub if necessary.

Trainer Notes

The site selection process should include the preparation of shade maps as described in Phase IV: Session 8.

CONSTRUCTION OF SOLAR AGRICULTURAL DRYERS

Total time: 16 hours

Objectives:

* To use various tools in the construction of solar agricultural dryers

* To build a solar agricultural dryer

* To develop a complete explanation of the solar agricultural dryer

Resources: Attachment V-8-A, "Materials Price List"

Materials: Tools and materials as specified in the participants' designs

Procedures:

Trainer Notes

This 16-hour session allows much latitude for individual trainer styles. It follows a format similar to the construction sessions for pedal/treadle power in Phase III and the solar water heaters in Phase IV. The following notes are here to give some guidance and share some experiences that have worked well during our training programs.

The session does not have to happen all at once. Since it is a 16-hour session, it should be complemented with other sessions, such as Health & Nutrition, The Role of the Volunteer in Development and other Core Technology sessions, and the following solar dryer sessions: Practical Drying Tips (Phase V: Session 15), Dryer Assessment and Modification (Phase V: Session 17) and Cost Benefit Analysis (Phase V: Session 18). See the phase calendar.

It is helpful, in fact, to spread the construction time over as many days as possible, because the participants will then have more "spare time" to discuss their projects and their problems outside of session time. Six or eight hours of the day give the participants sufficient time to set up, build and clean up.

Step 1. (Approximately 14 hours)
Have the participants form construction groups and build their solar dryers.

Trainer Notes

At the beginning of each construction period, have the participants discuss the events of the preceding day. Focus the discussions on the group dynamics and problem-solving methods that are being used by each group, what's working and what's not working, etc. This should take 15-25 minutes, depending on how many issues need to be brought up.

Remind the participants of how many hours remain in the construction part of the phase and that some time near the end of the phase should be spent on the development of a presentation for their device. When time begins to get short, encourage the participants to focus on the essential tasks only, and to divide them among group members to help speed up the process.

During the construction periods, keep in touch with how the groups are proceeding, taking time, when necessary, to show people how to properly use and care for tools.

Don't intervene every time the group or an individual makes a mistake. Mistakes are an important part of the learning process. Intervene only if the safety of the group is in danger or if a certain decision will prove fruitless and take a large amount of time away from the group.

Explain that any group finishing one project may go on with another small project, begin preparations for the presentation of their device or research other types of solar dryers.

Allow 10-20 minutes at the end of each construction period for cleanup of the work site and shop area.

At the end of the final construction session, plan about half an hour for a thorough cleaning of the work site and shop area.

Step 3. (Approximately 2 hours)
Have the participants prepare for the final presentation of their solar dryers. Provide them with relevant hints or guidelines.

ISSUES AND METHODS IN DEVELOPMENT AND DIFFUSION OF APPROPRIATE TECHNOLOGY

Total time:	4 hours (approximate)
Objectives:	* To compare and discuss general appropriate technology research and development policies * To identify and discuss specific techniques and potential difficulties related to the diffusion of technology in developing countries
Resources:	Jequier, Appropriate Technology: Problems and Promises, pp. 69-80
Materials:	Newsprint and felt-tip pens

Trainer Notes

This session will require considerable preparation in the following three major areas:

* Resource Material - Obtain a copy of the Jequier book for each participant (see bibliography). If this is not possible, a handout should be prepared which includes a summary of the essential points brought out in Chapter 6 of the Jequier book.

* Volunteer Participant/Facilitator - Beginning at Step 5, this session provides an excellent opportunity for a participant to practice facilitation skills. If you ask one of the participants to facilitate, it will be necessary to provide a thorough overview of the session in advance. Also, be certain to allow time at the end of the session to give feedback on the facilitation skills.

* Panel Discussion - Steps 5 through 9 of this session call for the participation of 3 to 5 guest panelists. Ideally, these panelists should be currently involved in development work and should represent a variety of perspectives (i.e., agency level work, community level work, work with women, work with men, etc.). You will need to select, invite and orient these panelists well in advance of the date of the session.

Step 1. (10 minutes)
Present a brief introductory overview of session objectives and procedures.

Step 2. (15 minutes)
Distribute the resource book (Jequier, Appropriate Technology: Problems and Promises) and ask participants to read Chapter 6, pp. 69-80.

Step 3. (15 minutes)
Discuss the reading material, focusing on the concepts of "centralization" and "decentralization" of the diffusion of appropriate technology.

Trainer Notes

Some suggested points to emphasize during this discussion are:

* The present system of research and development is geographically and administratively centralized in many countries.
* There is a need for local control (decentralization) in order to provide for community-based research and development of appropriate technology.
* Central governments need to support technological innovation on a national level to promote wide and active participation of all sectors of the population.
* Decentralization fosters local initiative and self-reliance.

Step 4. (20 minutes)
Have the participants generate a list of 5 or 6 general questions that will be used to help focus the panel discussion. Post the list on newsprint.

Trainer Notes

Emphasize the importance of keeping these questions as general as possible in order to allow spontaneity of the panel discussion. Some suggested questions include:

* What efforts are being made to decentralize technological research and development in your country?
* Are there organizations in your country that could provide support and/or assistance to appropriate technology volunteers?
* What are some effective techniques for facilitating community-based technological development?
* What are some effective ways of supporting existing indigenous technological development?
* What are some difficulties which an appropriate technology volunteer may encounter when dealing with local values, beliefs and organizational policies?

Step 5. (15 minutes)
Announce a 15-minute break and explain that the panel discussion will begin immediately afterward.

Trainer Notes

During this break, arrange the room so that the panelists will be seated where they can see the posted discussion questions.

If a participant has volunteered to facilitate the panel discussion, he/she should assume the role at this time and greet the arriving panelists, providing them with a brief summary of the proposed discussion procedures.

Step 6. (10 minutes)
Reconvene the group and introduce each of the panel members.

Step 7. (15-25 minutes)
Ask each of the panelists to speak for approximately five minutes regarding their roles and duties as development workers.

Step 8. (60 minutes)
Open the panel to questions from the audience.

Trainer Notes

Try to keep the questions centered around the general questions developed in Step 4.

Step 9. (40 minutes)
Thank the panelists for their participation and explain that following a 40-minute break, the participants will reconvene in order to summarize the session's activities.

Trainer Notes

During this break, you may find that participants want to speak individually and informally with certain panelists. This informal dialogue should be encouraged since it can provide an opportunity for additional questions and clarification.

If this informal dialogue is animated and flowing well, you may omit Step 10.

Step 10. (30 minutes)
Conclude the session by returning to the questions developed in Step 4 and asking participants to discuss any specific approaches provided by the panelists.

NATURAL COOLING

Total time: 2 hours

Objectives:
- * To discuss the relationship between heat transfer and natural cooling principles
- * To identify and describe various natural cooling techniques and devices
- * To discuss the different types of natural cooling techniques used in indigenous architecture throughout the world

Resources:
- * Leckie, Other Homes and Garbage
- * Wright, Natural Solar Architecture
- * Bainbridge, Natural Cooling Methods in California
- * Attachment V-12 "Natural Cooling Scenarios"

Materials: Chalkboard and/or newsprint and felt-tip pens

Procedures: Step 1. (5 minutes)
Present the objectives and describe the session activities.

Step 2. (40 minutes)
Draw the natural cooling matrix (See below) on the chalkboard and have the participants fill it in. Encourage discussion, comments and questions.

Trainer Notes

The natural cooling matrix includes the three types of heat transfer (conduction, convection and radiation -- See Phase III: Session 16/Heat Transfer) and the two ways a structure (house, building, etc.) can remain cool by "shielding" itself from any one of these types of heat transfer and/or by "shedding" heat in one of the three ways listed:

	Shield	Shed
Conduction		
Convection		
Radiation		

Continued

Trainer Notes/Continued

Some examples are:

- Conduction shield: insulation
  Conduction shed: living underground

- Convection shield: window or shutter
  Convection shed: chimney effect

- Radiation shield: shading device
  Radiation shed: cooling pond

Keep the examples related to housing or other building design.

Step 3. (10 minutes)
Have the participants describe and discuss other natural cooling devices they may know about.

Trainer Notes

These might include: natural refrigerators, cooling ponds, evaporative coolers, etc.

Step 4. (25 minutes)
Have the participants form four small groups. Distribute one scenario from Attachment V-4-A to each one of the groups and give them 25 minutes to develop a sketch or drawing of the natural cooling devices and techniques used.

Step 5. (25 minutes)
Reconvene the large group and have a representative from each small group describe the natural cooling devices and techniques that they developed.

Step 6. (15 minutes)
Facilitate a discussion of the application of natural cooling designs in-country.

Trainer Notes

Focus the discussion by asking:

- Which of the devices and techniques described in your "scenario sketches" might be applicable in your country of assignment?
- Which would not? Why?
- What cultural factors, beliefs or values might enhance or impede their applicability?

NATURAL COOLING SCENARIOS

1. Your Club Med Cruise is shipwrecked. You swim ashore and plan to stay for awhile. The island to which you swim is uninhabited, 35° C (95° F) and 90% humidity with biting bugs. Trade winds come from the west every afternoon. What type of shelter would you build to stay as cool as possible?

2. You and some friends want to get away from it all. You parachute from a commercial jet into an area that you think will be nice. However, it turns out to be a hot, dry desert. Hot days (50° C - 120° F) with cool nights (10° C - 50° F). The ground is a hard sandstone material with a deep gorge nearby. There's water in the gorge but not much wind. You can dig into the sandstone fairly easily. What would be your shelter?

3. Your car runs out of gas on a remote road in the Hindu Kush mountains. You and your friendly bus-mates decide to set up a home. You are situated on a rocky south-facing slope, with some trees. The winds blow strongly every afternoon. It's about 50° C (120° F) with no rain expected for months. The nights are cold (10° C - 50° F) and there's lots of sun. What type of house would you decide upon?

4. You and your friends end up in the middle of a jungle, 30° C (85° F) and 85% humidity. The wind doesn't blow very often. You're south of the equator, it's very shady and you decide to stay. What type of house would your group decide upon for maximum comfort?

APPROACHES TO HEALTH SYSTEMS

Total time: 2 hours

Objectives:

- To present and discuss various health care concepts and approaches
- To develop a list of guidelines for self-help community health systems
- To discuss the role of the volunteer in community health efforts

Resources: Refer to Phase III: Session 13, "Appropriate Technologies for Health"

Materials: Newsprint and felt-tip pens

Trainer Notes

The presentations made in this session are the result of an assignment given to the participants in Phase III: Session 13, "Appropriate Technologies for Health."

Procedures:

Step 1. (5 minutes)
Present the session objectives and outline the activities.

Step 2. (1 hour, 20 minutes)
Have the participants form their interest groups and give their presentations.

Trainer Notes

- Be sure a timekeeper is appointed, and that the presentations are limited to ten minutes each.
- Encourage questions, comments and discussion after each presentation.

Step 3. (35 minutes)
Have the participants develop a list of guidelines for self-help health programs and for the role of the volunteer in such efforts.

Trainer Notes

Post the suggested guidelines on newsprint. If the group needs assistance, some suggestions are:

* Locally-based and -operated programs
* Integration of local practitioners
* Volunteers as facilitators, not providers

Step 4.
Conclude by having participants discuss ways in which they might apply these guidelines in their work as Peace Corps Volunteers.

NUTRITIONAL GARDENING

Total time: 4 hours

Objectives:

* To define nutritional gardening and discuss its role in the development process

* To practice home gardening techniques

* To develop an essay, garden plan or community program strategy that addresses nutritional gardening in the development process

Resources:

* ACTION/Peace Corps, ICE, Small Vegetable Gardens

* Oxfam, Gardening for Better Nutrition

* Jeavons, How to Grow More Vegetables

* LIFE, Small Scale Intensive Food Production, pp. 60-80

* Attachment V-14, "Nutritional Garden Crops of the Tropics"

Materials: Suggested gardening assignments (on newsprint, see Step 7), newsprint and felt-tip pens or chalkboard/chalk, projector and screen (optional, see Step 5), materials as needed at "hands-on" stations (see Step 6)

Trainer Notes

This session will require considerable preparation. We recommend there be a model garden at the training site and that a wide selection of resource material on gardening be available to the participants for this session and throughout the program.

See Step 5: You will need to choose from among the suggested activities outlined in the Trainer Notes.

See Step 6: For this activity, you will need to set up at least three hands-on stations to provide skills training through demonstration and practice. All the materials for these stations must be ready before the step begins. You will need to invite gardening consultants who are qualified to demonstrate and explain the techniques at each station. The Trainer Notes in Step 6 provide details regarding the suggested format for setting up the hands-on stations.

Continued

Trainer Notes/Continued

See Step 7: Write on newsprint the suggested gardening assignments outlined in the Trainer Notes.

Procedures: Step 1. (15 minutes)
Review the session objectives and encourage participants to share their ideas and experiences on gardening.

Trainer Notes

Collect "Four Day Food Diary" and "Ecuadorian Diet" assignments as the session begins (from Phase II: Session 20, "Custom and Food").

Step 2. (20 minutes)
Have the participants list and discuss the differences between nutrition-oriented agriculture and commercial agriculture.

Trainer Notes

- List their responses on newsprint.
- Stimulate discussion by asking how these differences relate to the issues discussed in Phase II: Session 12, "Food Issues." (For example, cash cropping/subsistence farming, food as a commodity, food as a nutrient, etc.)

Step 3. (15 minutes)
Distribute Attachment V-14, "Nutritional Garden Crops of the Tropics," and give a brief talk on illnesses related to poor nutrition and nutritional crops that can help prevent them.

Trainer Notes

- Mention the problems associated with crop specialization and discuss the importance of growing nutritional food crops for immediate household use.
- Refer to the resource material and Attachment V-14 for background information.
- An excellent comparison of garden crop choices and nutrient values can be found in the LIFE publication (see Resources).

Step 4. (15 minutes)
Have the participants brainstorm a list of ways that nutritional gardening can play a role in development efforts.

Trainer Notes

Some ideas include:

- * More stable and continuous eco-system
- * Supply of greens
- * School lunch programs
- * Link to health services
- * Aim efforts at women
- * Integrate technologies (small-scale)
- * Encourage crop diversity, more edible crops
- * Nutrition emphasis -- food first, exchange next
- * Link to community participation

Step 5. (45 minutes)
Give participants an overview of home gardening techniques, technologies and processes.

Trainer Notes

Several options exist for this activity:

- * A slide show
- * A walking tour of a garden
- * Analysis of a garden project case study
- * A film
- * Reading time to survey available resources

Step 6. (2 hours)
Have the participants move through three hands-on garden stations and practice the techniques being demonstrated at each one.

Trainer Notes

For more information regarding appropriate gardening techniques, refer to the Resources. Also, each hands-on station should incorporate techniques which take into account specific environmental, cultural and economic factors that influence gardening in the countries in which the participants will be serving(i.e., climate, common insect pests, amount of time and money the people can invest, traditional tastes, beliefs about the supernatural, curative or nutritional values of certain plants,etc.).

Each hands-on station should have at least two staff members present to demonstrate and explain techniques.

Continued

Trainer Notes/Continued

To provide an overview of basic gardening, the three stations should demonstrate the following techniques:

Bed Preparation	Composting	Planting
Shape & size of bed	Size of pile	Direct planting
Fertilization	Shape of pile	Transplanting
Cultivation (digging)	Appropriate materials	Seed beds
Adjusting soil texture	Layering	Watering/irrigation
Adjusting Ph	Pit composts	Insect/pest control

If there is a mature garden available at the training site, a fourth station should be set up to demonstrate harvesting techniques.

It is important to explain to the participants that they should take time to do more independent research and study before beginning gardening programs as Peace Corps Volunteers.

Explain that one of the best ways to develop gardening skills is to plant their own small garden for their own use once they are in-country.

Step 7. (10 minutes)
Post the suggested gardening assignments and have the participants choose one to complete.

Trainer Notes

Post the following suggested gardening assignments:

* Develop a home garden plan to include a layout map, special considerations, research necessary, promises and potential problems.

* Develop a community program strategy to increase foods grown for the diet.

* Write an essay on the benefits and problems of nutritional gardening in appropriate technology development and how your role as an appropriate technology development facilitator might be affected.

Have participants determine how much time they will need to complete the assignment. Explain that it will be due before the end of the program.

NUTRITIONAL GARDEN CROPS OF THE TROPICS

High in protein, calories, calcium, iron, vitamins A, C and B.

Leafy Green Crops

Kale

Spinach

Beet greens

Amaranth

Broccoli

Bakchoy

Swiss chard

Cassava leaves

Sweet potato leaves

Okra leaves

Melon leaves

Papaya leaves

Taro leaves

Legume Crops

Cow peas

Ground nuts (peanuts)

Dhal (pigeon pea)

French beans (haricot, kidney and string)

Lima beans

Soya beans

Green-gram (mung)

Root Crops

Irish potatoes

Carrots

Sweet potatoes, yams

Solanaceous Crops

Tomatoes

Bringals (eggplant)

Peppers:

- Sweet (pimento)
- Chili (cayenne)

Cereal Crops

Maize

Millet

Wheat

Rice

PRACTICAL DRYING TIPS

Total time: 2 hours

Objectives:
- To taste and examine rehydrated foods
- To discuss practical solar food drying techniques and guidelines
- To discuss the effect of drying on the nutritive value of foods

Resources:
- Attachment V-15-A, "Summary of Temperature Factors that Affect the Preservation and Drying of Foods"
- Attachment V-15-B, "Practical Food Dehydration"

Materials: Various solar-dried foods (fruits, vegetables, fish, meat, etc.) stored in appropriate containers

Trainer Notes

It is essential to this session that the trainer have extensive practical experience in solar food drying, storing and preparation. If necessary, invite a local consultant with these skills to conduct this session.

You will need to rehydrate some solar-dried foods for tasting during this session. This can be done quickly by soaking them overnight or by boiling them.

Procedures: Step 1. (15 minutes)
Have the participants sample some of the solar-dried foods which have been rehydrated.

Trainer Notes

Encourage discussion of the texture, appearance, flavor, color, odor, etc. of the foods.

Step 2. (5 minutes)
Explain the session objectives and outline the activities.

Step 3. (30 minutes)
Give a short talk on practical food drying techniques, methods and guidelines. Encourage questions and discussion.

Trainer Notes

Your talk should include the following topics:

- Advantages and reasons for drying foods
- Insect/pest problems and solutions
- Storage techniques
- Recipes
- Time-saving techniques
- Avoiding drying too much or too little

Step 4. (25 minutes)
Distribute and discuss Attachments V-15-A and V-15-B, answering questions and encouraging discussion.

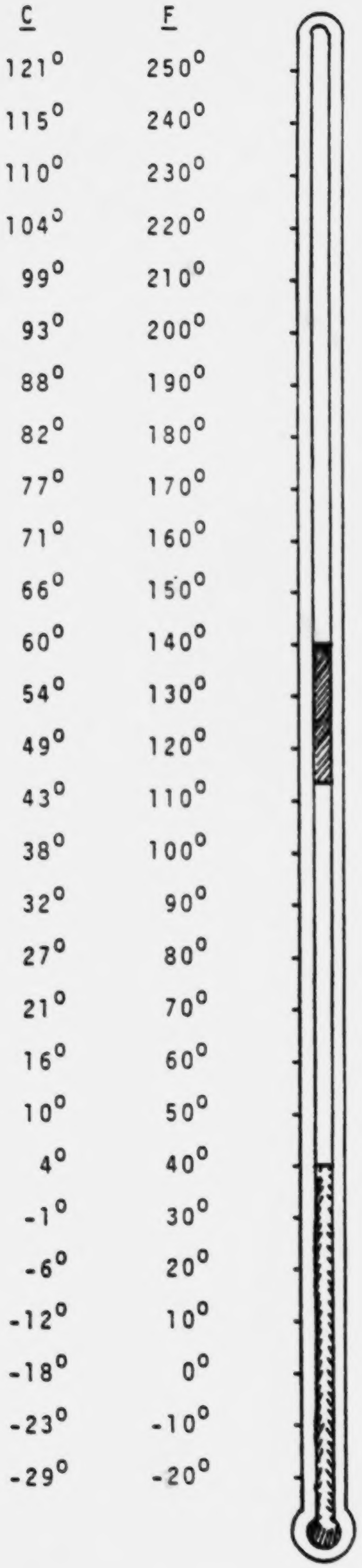
Step 5. (30 minutes)
Discuss the nutritive aspects of drying foods.

Trainer Notes

- Indicate those vitamins which are preserved and those which are lost in the drying process.

- Stress Vitamin C as being particularly fragile, subject to degradation by light and heat and best obtained from fresh foods.

Step 6. (15 minutes)
Conclude by reviewing the objectives and answering final questions.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-6° 20°
-12° 10°
-18° 0°
-23° -10°
-29° -20°

SUMMARY OF TEMPERATURE FACTORS THAT AFFECT THE PRESERVATION AND DRYING OF FOODS

Blanch (full steam) at 100°C. Boil water to sterilize for treatment solutions for 20 minutes.

Pasteurize fruit for 15 minutes and vegetables for ten minutes at 80°C.

Over 60°C, food will cook, scorch and lose nutrients.

Food kept in dryer at 57°C for one hour is pasteurized sufficiently.

The range of 45°C to 60°C is good for drying food quickly with little loss of nutrients and color and protection from microorganisms and enzyme action.

Fish will cook in direct sunlight even in the 20°C to 30°C range.

Below 40°C in a humid climate, food can spoil on the drying trays.

Store dried meat and fish at 5°C or below. High protein foods spoil more easily than other foods.

PRACTICAL FOOD DEHYDRATION

Operation of the dehydrator is not complex but requires conscientious, systematic attention. Each operator should develop a satisfactory method of food dehydrating to match his/her climate, daily schedule and food source. The following guidelines will help to establish a dehydration system.

1. Choose fresh, ripe (not overripe), undamaged foods.
2. Slice food into long, thin slices, less than 1/2" thick. Cut meat or fish into small chunks for soups or stews. Use a stainless steel knife to minimize discoloration. Cut and prepare foods quickly. Make all pieces uniform in size.
3. Lay pieces close to each other without overlapping. Allow for air to circulate between pieces.

   Load: 2.5 lbs. per square foot of tray with pre-heater
   1.5 lbs. per square foot of tray without pre-heater
4. Blanching is not advised but will aid preservation in some cases.
5. Rotate food trays 180° once each day for even drying.
6. Weigh food before drying and after three days of drying. (Weigh without trays for better accuracy.) Food is "dry for storage" if final weight is 1/5th of original. (This varies depending on percentage of moisture in various foods.) Remove 88% of moisture to stop spoilage. (See formula below.)
7. Dehydration time depends on humidity, type of food, food moisture, percent sunshine, etc. Three to four sunny days is average.
8. Use a thermometer in the cabinet to maintain temperature by manipulating vent damper.

Dry Weight Formula

Dry Weight = (original weight of food) - (original weight percent moisture) + (.10 x original weight x % moisture)

Dry Weight = (original weight) x (1 -.9 [% moisture of food])

Example: What will be the dry weight of 6 lbs. of apricots if their original moisture is 92%?

Dry Weight = 6 lbs. x (1 - .9 [.92])
= 6 lbs. x (.17)
= 1.02 lbs. (Therefore, dry the apricots until they weigh one lb.)

Storing Dehydrated Foods

1. Store in a cool, dark, dry place, in small, airtight containers.
2. Store in paper bag or cheesecloth for one week to absorb surface moisture. Transfer to glass jars or hard plastic containers.

CARDIOPULMONARY RESUSCITATION

Total time: 4 hours

Objectives:

- To perform effective CPR techniques on adult and infant mannequins
- To complete a written CPR examination
- To discuss appropriate applications for CPR
- To gain certification as "Basic Resuscitators" for the period of one year

Resources:

- American Heart Association, A Manual for Instructors of Basic Cardiac Life Support
- American Red Cross, Instructor's Manual - Cardiopulmonary Resuscitation
- Films: "Citizens for Life" or "New Pulse for Life," available from either American Heart Association or American Red Cross
- Attachment V-16-A, "Circulation and Bones in the Chest"
- Attachment V-16-B, "Performance Test"
- Attachment V-16-C, "Basic CPR Exam"

Materials: Newsprint and felt-tip pens; movie screen and projector; timing devices; infant and adult mannequins designed for CPR practice; blankets

Trainer Notes

This CPR session prepares the participant for one-year certification as a "Basic Resuscitator," according to the American Heart Association requirements. It easily can be adapted to meet American Red Cross certification requirements as well.

There should be a certified instructor for every 12 people. (Any participants who are already certified as Basic Resuscitators can assist with the demonstrations and with the skill practice groups.)

If you are not a certified "Basic Life Support Instructor," you should contact the nearest Red Cross office and invite an instructor to lead the session.

Procedures: Step 2. (15 minutes)
Review and clarify the session objectives and activities.

Trainer Notes

Clarify your role as a Basic Life Support Instructor and explain that participants who successfully complete this CPR course will be officially certified by the American Heart Association as "Basic Resuscitators" for one year.

Explain that CPR is part of this program because it is seen as an important technology for health.

Present any other certified Basic Resuscitators from among the group who will be on hand to assist you (see Trainer Notes, under Materials).

Step 2. (20 minutes)
Show the film.

Trainer Notes

The films listed in the resource section are excellent for this session. If the film is not used, refer to the cited manuals for alternative procedures.

It is important to note any obsolete information and carefully emphasize updates. Explain that standards are regularly updated as research and experience refine CPR techniques.

Ask the participants while watching the film to take note of any misconceptions about CPR they held prior to viewing it.

Step 3. (10 minutes)
Distribute and review Attachment V-16-A, "Circulation and Bones of the Chest."

Trainer Notes

Ask if there are any comments or points from the film that require clarification or emphasis.

Step 4. (15 minutes)
Demonstrate various CPR techniques.

Trainer Notes

Demonstrate and explain the following techniques:

* One person adult CPR
* Two-person CPR (include the "switch")
* CPR on an infant

Step 5. (5 minutes)
Distribute and review Attachment V-16-B, "Performance Test."

Trainer Notes

Explain the evaluation process by indicating that there will be a test of CPR skills before certification. Also mention that the written test is part of the certification process.

It is important that the participants understand the skill test process and that specific checkpoints will be covered in the test which are listed in the attachment.

Step 6. (1 hour)
Have the participants form skill practice groups of five people per mannequin.

Trainer Notes

* Emphasize that each group member should spend time learning and practicing each of the demonstrated CPR techniques.

* Explain that as each person practices, the Performance Test sheets can be used to check the performance.

* Encourage the group members to critique one another's performance.

* Circulate among the groups to assist whenever necessary. (Other certified Basic Resuscitators should also help.)

Step 7. (30 minutes)
Distribute Attachment V-16-C, "Basic CPR Exam," and give participants time to answer the questions and encourage them to share their answers.

Trainer Notes

* Guide an exchange of answers by having participants read a question and answer it. This time can also be used to elaborate on any additional CPR points.

* Have people rate their scores and keep the exam.

Step 8. (1 hour)
Carry out the performance testing.

Trainer Notes

The performance testing should be carried out in the following manner:

- Set up a testing station with an adult and infant mannequin.
- Call one person at a time to be tested.
- Collect each person's CPR Exam and Performance Test, making certain they are signed.
- Have each person demonstrate the three techniques for meeting certification requirements.
- Present each participant with signed certificates.

Encourage those who are waiting to be tested to continue with their practice.

Step 9. (10 minutes)
Reconvene the participants and facilitate a discussion of the appropriate application of CPR in an in-country situation, concentrating on cultural norms and sex roles.

Step 10. (10 minutes)
Review and discuss the session objectives and activities.

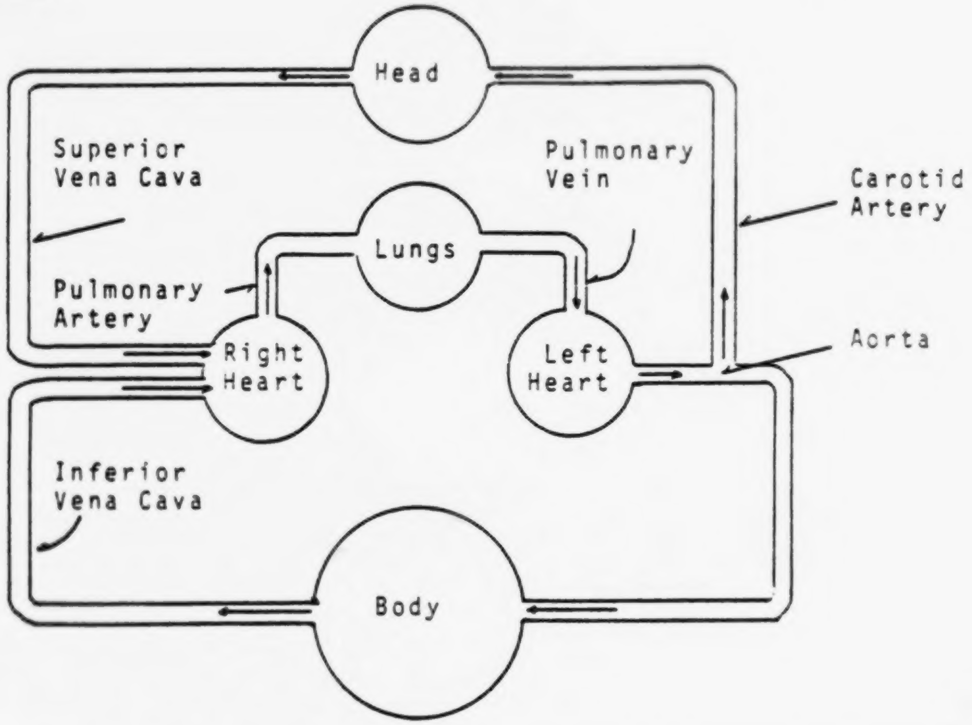
Trainer Notes

Some questions to stimulate discussion include:

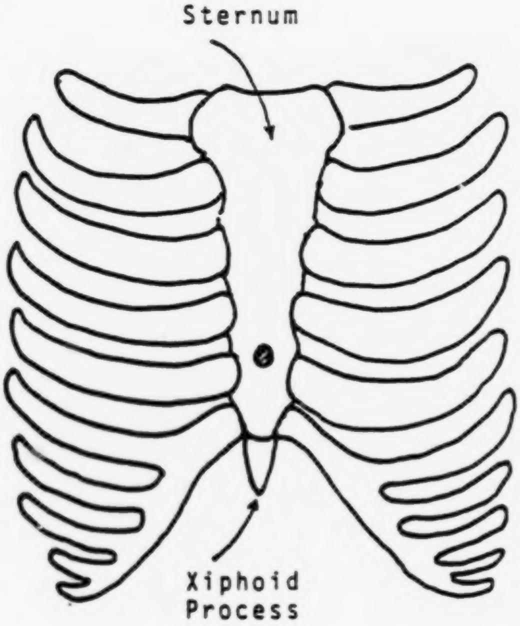
- How effective was the film in conveying techniques and information?
- Did your practice groups give useful feedback to help improve your skill level?
- Did you have enough time in your practice period to learn the necessary CPR techniques?
- Do you feel confident to use CPR when appropriate and necessary to save someone's life?
- Do you think you will attempt to get re-certified after one year?
- Were the session objectives met?

Step 11. (5 minutes)
Conclude by encouraging the participants to contact organizations for standards and compliance with local regulations, once they are in-country.

CIRCULATION


Head
Superior
Vena Cava
Pulmonary
Vein
Carotid
Artery
Lungs
Pulmonary
Artery
Right
Heart
Left
Heart
Aorta
Inferior
Vena Cava
Body

BONES IN THE CHEST


Sternum
Xiphoid
Process

ATTACHMENT V-16-B - Page 1

AMERICAN HEART ASSOCIATION
CARDIOPULMONARY RESUSCITATION AND EMERGENCY CARDIAC CARE
PERFORMANCE TEST FOR ONE AND TWO RESCUER CPR

NAME: ______________________ Date: ______________

	ELAPSED TIME (Seconds) Min	Max	ACTIVITY AND TIME (Seconds)	CRITICAL PERFORMANCE	PASS	FAIL
ONE RESCUER	4	10	Establish unresponsiveness & call out for help. Allow 1 to 10 sec. if face down and turning is required.	Shake shoulder, shout "Are you OK?" Call out-"Help!" Turn if necessary		
				Adequate time		
	7	15	Open airway. Establish breathlessness.(Look Listen and Feel) (3-5 seconds)	Kneels properly		
				Head tilt with one hand on forehead and neck lift or chinlift with other hand.		
				Ear over mouth, observe chest.		
	10	20	Four ventilations (3-5 seconds)	Ventilate properly 4 times and observe chest rise.		
	15	30	Establish pulse and simulate activation of EMS system (5-10 seconds)	Fingers palpate for carotid pulse on near side (other hand on forehead maintains head tilt)		
				Know local EMS number		
				Adequate time		
	69	96	Four cycles of 15 compressions 2 ventilations (54-66 seconds)	Proper body position		
				Landmark check each time		
				Position of hands		
				Vertical compression		
				Says mnemonic		
				Proper rate		
				Proper ratio		
				No bouncing		
				Ventilates properly		
	72	101	Check for return of pulse and spontaneous breathing. (Pupil check optional) (3-5 seconds)	Check pulse and breathing (Pupil check optional)		
TWO RESCUERS	77	106	Second rescuer check for pulse (5 seconds)	Five-second pause to check pulse		
	85	116	Minimum of two cycles of 5 compressions and 1 ventilation (8-10 seconds) Switch and repeat until examiner is satisfied.	Changes rate of compression		
				Says mnemonic		
				Interposes breath		
				No pause for ventilation		
				Calls for switch		
				Switches		
				Switches back		
				Checks pulse		
				(Pupil check - optional)		
				Technique as above		

AMERICAN HEART ASSOCIATION
CARDIOPULMONARY RESUSCITATION AND EMERGENCY CARDIAC CARE
PERFORMANCE TEST FOR INFANT RESUSCITATION

Name: ______________________________

Social Security Number: ______________ Date: ______________

ELAPSED TIME (Seconds)		ACTIVITY AND TIME (Seconds)	CRITICAL PERFORMANCE	PASS	FAIL
Min	Max				
3	5	Establish unresponsiveness including turning (3-5 seconds)	Shake shoulder, shout Infant horizontal		
			Adequate time		
6	10	Open airway	Tip head back -- Do not hyperextend		
		Establish breathlessness (3-5 seconds)	Put ear over mouth to feel for breathing		
9	15	Four ventilations (3-5 seconds)	Puff cheeks, uses air in mouth to ventilate		
14	25	Establish pulselessness (5-10 seconds)	Use same criteria as before Carotid or precardial pulse		
44	55	8 cycles of 5 compressions and 1 ventilation Continue uninterrupted (30 seconds)	Two fingers for compression 80-100 compressions per minute		

Number of compressions 40-50 Number of ventilations 12-14

Instructor: ______________________ Check one: PASS ______ FAIL ______

Prepared by the Committee on Emergency Cardiac Care

Select the one correct answer and circle on your answer sheet as indicated:

1. Cardiopulmonary resuscitation can be defined as artificial respiration and artificial circulation.

   A. True B. False

2. The A, B, C's of cardiopulmonary resuscitation stand for Airway, Breathing and Circulation.

   A. True B. False

3. One can determine if an unconscious victim is breathing by:

   A. Looking, listening, feeling for signs of air and chest movement
   B. Checking the blood pressure
   C. Checking the pulse
   D. Checking for cyanosis

4. In mouth-to-mouth resuscitation, tilting the head back is important because:

   A. Air cannot enter the stomach
   B. It allows the individual doing the breathing to more easily observe the victim's body
   C. It extends the neck and lifts the tongue away from the back of the throat

5. CPR is unlikely to restore a victim to his pre-arrest level of brain function if the cardiac arrest has persisted for more than :

   A. 1-2 minutes
   B. 2-4 minutes
   C. 3-5 minutes
   D. 4-6 minutes

6. If vomiting occurs during the resuscitation effort,the best immediate procedure to follow is:

   A. Stop CPR until help arrives
   B. Pause for a moment until the victim appears quiet again, then resume mouth-to-mouth ventilation
   C. Turn the victim on his side, sweep out the mouth, then re-position and resume CPR

7. Pain is one of the most common warmings of heart attack. It is frequently confused with indigestion, with uncomfortable pressure and a burning feeling in the lower chest or upper abdomen.

   A. True B. False

8. In performing CPR, airway (A) and breathing (B) are established adequately before circulation (C) is begun.

   A. True B. False

9. When performing external cardiac compression on an adult, the sternum should be depressed:

   A. 1/2 to 1 inch
   B. 1 inch to 1-1/2 inches
   C. 1-1/2 inches to 2 inches
   D. 2 to 2-1/2 inches

10. When one rescuer performs CPR, the ratio of chest compressions to lung inflations for any adult victim is:

    A. 15 compressions to 2 ventilations
    B. 12 compressions to 2 ventilations
    C. 7 compressions to 2 ventilations
    D. 5 compressions to 2 ventilations

11. CPR is effective when the victim is lying on a soft bed.

    A. True B. False

12. Artificial circulation is produced when the chest is compressed by squeezing the heart between:

    A. The clavicle and the scapula
    B. The sternum and the spine
    C. The clavicle and the spine
    D. The sternum and the xiphoid

13. When performing CPR on an infant, the compression rate is:

    A. 60-70 times per minute
    B. 100-120 times per minute
    C. 120-140 times per minute

14. The universal distress signal characterizing an apparent obstructed airway in the conscious adult is:

    A. Rapid heavy breathing
    B. Violent choking
    C. Victim's hand is at his throat
    D. Violent thrashing of the victim's arms

15. Which is the rate of compressions and ventilations when performing two-person rescue?

    A. 5 to 1
    B. 8 to 1
    C. 10 to 2
    D. 15 to 2

Prepared by American Heart Association, 2320 Greenville Avenue, Dallas, Texas 75231.

DRYER ASSESSMENT AND MODIFICATION

Total time:	4 hours
Objectives:	* To identify and list assessment considerations for solar dryers * To develop a solar dryer assessment plan * To evaluate and assess a solar dryer * To modify a solar agricultural dryer
Resources:	Attachment V-17, "Evaluation Checklist for Solar Agricultural Dryers"
Materials:	Newsprint and felt-tip pens, scales, thermometers, food preservation equipment, samples of dried food

Trainer Notes

This session should be scheduled near the end of the solar dryer construction session (see phase calendar) when the construction groups have finished their solar dryers and have tested them for as long as time will allow (so that there will be a dried food product to assess).

Procedures: Step 1. (5 minutes)
Present the objectives and outline the session activities.

Step 2. (20 minutes)
Have the participants develop an evaluation checklist for their solar food dryers.

Trainer Notes

The checklist should include the following considerations:

* Type of food
* Time since harvest
* Special treatments (e.g., addition of salt or sulfur)
* Amount of food in dryer
* Time left to dry
* Climatic condition
* Temperature inside and outside of dryer
* Relative humidity (if known)
* Vent size and/or any changes in vent size
* Modifications during the drying time

Step 3. (15 minutes)
Distribute and review Attachment V-17, "Evaluation Checklist for Solar Dryers," explaining that it was developed in an earlier training program. Have the participants compare and contrast the checklists, making changes and additions.

Step 4. (1 hour, 50 minutes)
Have the participants form their construction groups and evaluate and modify their solar agricultural dryers, using the checklists.

Trainer Notes

Point out that the most important aspect of this activity is the assessment process. The modifications should be done only if time remains after doing the assessment.

As part of the assessment process, have participants prepare a written list of possible modifications and explain that this list will be used later as the basis for a presentation.

Step 5. (30 minutes)
Have the groups prepare to present their assessment findings and lists of modifications.

Step 6. (25 minutes)
Reconvene the groups and have them present their assessment findings and lists of modifications. Encourage questions, comments and discussion.

Step 7. (20 minutes)
Review and summarize the assessment and modification process and discuss how such assessments could be carried out in-country.

Trainer Notes

Emphasize the importance of the involvement and participation of the community (villages, neighborhood, etc.) in all of the stages of dryer design and use.

Explain that it is especially important that the community is involved in and understands the assessment and modification process in order to enable them to independently continue to develop and use solar agricultural dryers.

EVALUATION CHECKLIST FOR SOLAR AGRICULTURAL DRYERS

_____ Compare to the local method for:

  - Quality
  - Speed (days to dry)
  - Ease of use

_____ Culturally acceptable? (Meets an established need?)

_____ Large enough?

_____ Ease of maintenance?

_____ What does it cost? (What is the mix of local and imported resources used?)

_____ Design review accomplished? (Modifications to improve it; performance checks, such as air flow.)

_____ Temperatures achieved? (Right temperature range? Adequate range of vent size openings?)

_____ Simplicity? (Uses the least items to make, is understandable, does most easily the job which needs to be done?)

_____ Suits the user population? (i.e., light enough for kids or women to move if that is required?)

_____ Construction process? (How did it go? How to do it? Lessons learned? Problems/solutions? Time to build?)

Test Drying: "Dry Run"

_____ Type of food

_____ Treatment of food (slicing, direct or indirect sun)

_____ Weight change

_____ Time line (when things are put in, weighed, etc.)

_____ Notes (i.e., bugs, leaks, etc.)

_____ Climatic conditions (wind, clouds, fog, etc.)

_____ Temperatures (ambient and at dryer-top outlet)

_____ Vent sizes

_____ Design changes during dry run (i.e., adjusting vents or orientation)

INTRODUCTION TO COST BENEFIT ANALYSIS (CBA)

Total time: 1 hour

Objectives:

- To review and discuss the basic principles of cost benefit analysis (CBA)
- To determine the cost benefit of an appropriate technology
- To discuss how cost benefit analysis can be used in community development work

Resources:

- Attachment V-18-A, "An Outline of Cost Benefit Analysis"
- Attachment V-18-B, "Sample Cost Benefit Analysis of Solar Cooler"

Materials: Newsprint and felt-tip pens, pencils, paper

Procedures: Step 1. (5 minutes)
Review the objectives and outline the session activities.

Step 2. (10 minutes)
Distribute, review and explain Attachments V-18-A and V-18-B.

Trainer Notes

- Carefully explain each major point on Attachment V-18-A, referring participants to Attachment V-18-B for examples.
- Point out that the figures on Attachment V-18-B are intended only for practice purposes and not meant to reflect the actual costs.

Step 3. (30 minutes)
Have the participants solve two or three sample cost benefit problems.

Trainer Notes

- Ask that those participants who understand the formulas help those who are having difficulty.
- Encourage construction groups to prepare a cost benefit analysis as part of their final presentations.

Step 4. (15 minutes)
Conclude by discussing how cost benefit analysis can be used in community development work.

Trainer Notes

Stimulate discussion by asking the following questions:

- What are the strengths and weaknesses of CBA?
- To whom is CBA important?
- What information can CBA provide? Not provide?
- How would you explain CBA principles to people with little or no formal education?
- Can the formulas be simplified?

AN OUTLINE OF COST BENEFIT ANALYSIS

1. Opportunity Cost (fill in a definition in your own words)

2. Present Value (PV)

Problem: What is the present value (PV) of $100.00 of total benefits received a year from now?

If you receive an interest rate of $10% per year, then

$$\underset{\text{PV}}{\text{(Present Value)}} + \underset{(\text{PV} \times 10\%)}{\text{(Interest)}} = \$100 \text{ or}$$

$$\text{PV} (1.10) = \$100 \text{ so}$$

$$\text{PV} = \$100/1.10 = \$90$$

3. PV of a Project

In words: The present value equals total benefits minus total costs divided by one plus the interest rate.

Equation: $\text{PV} = \frac{(B - C)}{(1 + r)}$; r = interest rate

For several years: $\text{Net PV} = \sum_{i=1}^{n} \frac{(B_i - C_i)}{(1 + r)^i}$; 1 = year of cost + benefits

4. Steps for Determining PV of a Project

A. List all costs and benefits (labor, materials, maintenance).
B. Adjust costs and benefits involving foreign exchange upwards by the foreign exchange multiplier.
C. Add up total benefits (B) and total costs (C).
D. Use equation to calculate PV or Net PV.
E. Compare options and choose project with highest PV (for 1 year) or Net PV (over many years).

SAMPLE COST BENEFIT ANALYSIS OF A SOLAR COOLER (Over one year)

COSTS

Equipment

1. Lid:	
Paint	$ .05
Straw	.00
Polyethylene (12 ft.^{2}), import/.60 x 1.5*	.90
Tape, import .05 x 1.5*	.08
Subtotal	1.03
2. Innards:	
Base support	.50
Cannister	1.00
Metal restraints	.25
Wood restraints	.00
Various plugs	.70
Subtotal	2.45
3. Outer Container import,$10 x 1.5*	15.00
Total Equipment	18.48

Labor

3 workers x 10 hours @ 50¢ per hour	15.00

Annual Maintenance

1. New paint	.05
2. 10 minute adjustments per day x 50¢/hour x 365 days	30.40
Total Annual Maintenance	30.45
TOTAL COSTS	$63.93

Interest rate = 10%
Wage rate = $4/day
* Foreign exchange multiplier = 1.5

BENEFITS

Food Loss Avoided

10¢ saved/day x 365 days	$ 36.50

Improved Health

5 fewer illnesses/year x($5 savings in medical costs + $28 in wages no longer lost)	165.00

Value of Cool Drinks

Cost of cool beer = $.50 Cost of warm beer = $.25 (.50-.25)x365 days	91.00

Additional Benefits

Value of time saved by cooking leftovers?

Increased straw?

TOTAL BENEFITS	$292.50

Present value =

$$\frac{(\text{Benefit - Cost})}{1 + \text{interest rate}}$$

$$= \frac{(292.50 - 63.93)}{1.10}$$

$$= \$207.70$$

PRESENTATION OF SOLAR DRYERS

Total time: 2 hours

Objectives:

- To give a presentation explaining the design, construction and application of a solar dryer
- To use effective facilitation skills and non-formal education techniques
- To evaluate the solar agricultural dryer phase

Resources: Pett, Audiovisual Communications Handbook

Materials: As determined by the construction groups

Trainer Notes

Two hours of preparation time was allotted for these presentations in Phase V: Session 10.

Procedures:

Step 1. (5 minutes)
Review the session objectives and procedures.

Step 2. (10 minutes)
Explain the basic format for each presentation and give participants a few minutes to decide among themselves how they will give the presentations.

Trainer Notes

Prior to the beginning of the presentations, establish an order in which the presentations will occur, set time limits, name a timekeeper and allot time at the end of each presentation for questions and feedback.

Explain that the basic format for each presentation should be:

- To set up any necessary materials, devices, visual aids, etc.
- To explain to the audience the role that they should be assuming, e.g., villagers, university professors, host country agency representatives, Peace Corps trainees, etc.
- To give the presentation
- To ask for questions or further clarification
- To ask for feedback regarding NFE techniques and facilitation skills

Step 3. (1 hour)
Have each group give their presentation.

Trainer Notes

The feedback activity at the end of each presentation is important because it will help participants improve skills in facilitating presentations. Provide focus for this portion of each presentation by asking the following questions:

* What did you think was the most effective part of the presentation? The least?
* What NFE techniques were used?
* Was the audience invited to participate?
* Do you think the presentation was clear?
* Could it be used in a village setting in the Third World?
* What are some examples of effective facilitation skills that were demonstrated?
* What could have been done to make the presentation better?

Step 4. (30 minutes)
Have the participants regroup and give feedback regarding the overall solar dryer phase.

Trainer Notes

Center this discussion around some of the following questions:

* Were all or most of the phase's objectives met?
* What was the most important thing each participant learned during the phase?
* What did you like the least about the phase?
* How did the group dynamics work during the phase?
* How were problems solved during the design and construction sessions?
* Did the problem-solving change during the phase?
* What do people think of solar dryers as an appropriate technology?

Step 5. (15 minutes)
Have the participants clean up the work area.

INTRODUCTION TO THE FINAL PHASE OF THE TRAINING PROGRAM

Total time: 2 hours

Objectives:

- To review and clarify the schedule and goals for Phase VI
- To discuss and clarify guidelines for preparing the final Volunteer in Development assignment
- To discuss and review the final technical skills assessment
- To review guidelines for presenting demonstrations
- To review guidelines for planning the Energy Fair
- To identify and list major tasks involved in preparing for the Energy Fair

Resources:

- Attachment V-20-A, "The Role of the Appropriate Community Technology Development Facilitator: A Transition to Peace Corps Service"
- Attachment V-20-B, "Skills and Knowledge Assessment Sheet"
- Attachment V-20-C, "Demonstration Guidelines"
- Attachment V-20-D, "Guidelines for Planning the Energy Fair"

Materials: Newsprint and felt-tip pens

Procedures: Step 1. (10 minutes)
Explain the overall goals of the final phase of the training program and review the session objectives.

Trainer Notes

Develop your remarks based on the following general points:

- During this phase, the participants will begin to apply the knowledge, attitudes and skills acquired during the training program in a manner that demonstrates a grasp of the training philosophy and goals.
- The final phase of training serves as an opportunity for the participants to reflect upon their progress and changes and

Continued

Trainer Notes/Continued

to draw together the major themes of the program in a way that integrates the learning experiences that have occurred in the past weeks. They are urged to contemplate and digest what has been learned and are encouraged to work independently and in small groups. It is intended that the participants will be guided toward the development of individual styles and approaches that will assist them during the transition from training to Peace Corps service and will serve them well during their time overseas.

* Throughout the week, the participants will utilize the cognitive and physical skills they have gained to demonstrate an understanding of potentially appropriate technologies within the context of the social, cultural, economic and health considerations that exist in developing countries.

Step 2. (15 minutes)
Post and review the schedule for Phase VI and explain its major components.

Trainer Notes

The major components of Phase VI can be outlined as follows:

1. A final Volunteer in Development assignment
2. An assessment of technical skills levels
3. The Energy Fair
4. Evaluations of both the Energy Fair and the overall training program
5. A final, written evaluation/recommendation regarding the participant's suitability for continued Peace Corps service (See Phase VI: Session 1)

Write these components on newsprint as you are explaining them.

Step 3. (15 minutes)
Distribute copies of Attachment V-20-A, "The Role of the Appropriate Community Technology Development Facilitator: A Transition to Peace Corps Service." Review it with the group and encourage questions and comments.

Trainer Notes

In reviewing and explaining Attachment V-20-A, you should stress the following points:

Continued

Trainer Notes/Continued

* The purpose of the assignment is to provide participants, the training staff and the in-country Peace Corps staff with a clear, thoughtful and concise description of the participant's perceptions of the role of an appropriate community technology development facilitator as it pertains to the individual jobs and country of assignment.

* Participants should share their perceptions and ideas with one another as they are completing the assignment.

* The deadline for submitting the final written assignment should be no later than the second day of Phase VI. This will enable the training staff to review them before the final interviews.

Step 4. (10 minutes)
Distribute and review Attachment V-20-B, "Skills and Knowledge Assessment Sheet."

Trainer Notes

Explain that the final assessment of technical skills levels serves:

* To provide a basis for judging the effectiveness of the training program in developing these skills by comparing it with the first assessment sheet prepared during Phase I
* To provide participants, the training staff and in-country Peace Corps staff with a current assessment of specific skill levels

Mention that this assessment should be completed and turned in along with the final Volunteer in Development assignment (Role of the Appropriate Community Technology Development Facilitator)

Step 5. (15 minutes)
Present a brief introduction of the purpose and general objectives of the Energy Fair. Encourage comments, questions and discussion.

Trainer Notes

As an aid in developing this introduction, stress the following points:

* Festivals and fairs have always been important to community life. They provide a traditional time for people to gather,

Continued

Trainer Notes/Continued

share experiences, enjoy one another's company and learn about new happenings or innovations. In developing countries, the importance of community gatherings is apparent because festivals often serve as the focus of community activity for days -- or even months.

- The Energy Fair should be a good opportunity for participants to enjoy and learn from one another and from the larger community.
- The Energy Fair will provide participants with an opportunity to creatively demonstrate and use devices built during the training program, while emphasizing appropriate use of facilitation, communication and technical skills.
- The Energy Fair is essentially the participants' opportunity to use the "Skills for the Development Facilitator" as outlined in the manual introduction.

Step 6. (15 minutes)
Distribute and review Attachment V-20-C, "Guidelines for Planning the Energy Fair," and Attachment V-20-D, "Demonstration Guidelines." Encourage questions and discussion.

Step 7. (25 minutes)
Have the participants brainstorm a list of the major tasks involved in carrying out the Energy Fair.

Trainer Notes

Mention such general task areas as: promotion, budget control, scheduling, setting up, music, games, demonstrations, etc.

Step 8. (15 minutes)
Conclude by reviewing the session objectives and encouraging any final questions regarding the activities in Phase VI.

Trainer Notes

The evaluation of the Energy Fair and the overall program evaluation will occur on the final day of training. These activities are designed to require a volunteer facilitator from among the participants. In order to allow for sufficient preparation, select those facilitators at this time.

THE ROLE OF THE APPROPRIATE COMMUNITY TECHNOLOGY DEVELOPMENT FACILITATOR: A TRANSITION TO PEACE CORPS SERVICE

Present a clear, thoughtful and concise description of your perceptions concerning your role as a Peace Corps Volunteer. Include the following points for consideration:

* Your definition of appropriate community technology.

* Your understanding of the job or project to which you have been assigned.

* The manner in which you have been prepared by this training program.

* An honest appraisal of your skills in technical, cognitive and social areas.

* The limitations you perceive in your abilities and in the potential job situation.

* The ways in which health and nutrition training may facilitate your role as a PCV and as an appropriate community technology facilitator.

* Methods you will consider in order to encourage the active participation and inclusion of all community members affected by your project.

* How your job or project may contribute to improving the quality of life of the people affected.

* Methods you plan to use for effective community involvement in the application of technologies and devices.

The description should be prepared carefully and should reflect your philosophy and current perspective on training and Peace Corps service. A copy of your paper will be given to you to take with you. It will be interesting to review it and compare it with your realities and job situation a year from now. Another copy of your paper will be sent to your in-country Peace Corps Director and will be considered as a component of your final evaluation.

SKILLS AND KNOWLEDGE ASSESSMENT SHEET

Indicate your level of experience in each of the following areas:

	None	Little	Average	A Lot
Carpentry				
Plumbing				
Use of power tools				
Use of hand tools				
Pedal power application				
Solar water heater design				
Solar water heater construction				
Other (explain)				
Using recycled materials				
First aid or other health-related skills				
Nutrition				
Cross-cultural training or experience				
Working independently				
Coordinating the work of others/management				
Neighborhood organizing				
Coordinating meetings and facilitating				
Teaching				
Fundraising				
Experience in small business ventures				

What are the three most important technical skills you would like to learn?

1. ______________________
2. ______________________
3. ______________________

What are the three most important non-technical skills you would like to learn?

1. ______________________
2. ______________________
3. ______________________

GUIDELINES FOR PLANNING THE ENERGY FAIR

- All participants should participate fully in the preparation and demonstration of devices and be responsible for food, fuel, water supplies and any other necessary materials.

- Throughout the activities of the Fair, there should be an emphasis on the integration of the themes presented during training, including implications for:

  1. Health
  2. Participation of all community members
  3. Concepts of adult learning
  4. Global energy and development issues
  5. Technical information transfer
  6. Appropriate communication and extension skills

- Information should be available to all guests and community members.

- Music, games and food should be an integral part of the Fair.

- A schedule of events should be developed and made available to all participants and guests.

- The role of the training staff will be to provide guidance and advice. The program participants should have the opportunity to be responsible for all aspects of the Fair.

- The first three days of the final phase will be provided for planning and preparation. During this time, final evaluations and interviews will also occur.

- One of the major objectives of the Energy Fair is to provide an opportunity to competently use and demonstrate devices built during the training program while focusing on the use of appropriate facilitation skills and methods of communication.

DEMONSTRATION GUIDELINES *

Purpose

It is very important that you have clearly in your mind the exact purpose of your demonstration. If your purpose is not clear to you, you will not be able to communicate it clearly to someone else.

The first thing you must consider in giving a demonstration is your audience. The following is a list of questions which should be considered when planning a demonstration.

1. How large is your audience?
2. Is there an optimum size?
3. What is the audience interest?
4. What is the audience age?
5. What is the audience's level of education?
6. How much does the audience know about the subject?

Key points:

7. If the subject of demonstration is new to the audience, can it be related to some experience or subject common to all?
8. Does implementing demonstration techniques involve financial or emotional risk to members of the audience?

Planning

Secondly, you should plan the procedure step by step to eliminate confusion, keep things moving smoothly, ensure correct results and, most important of all, know your subject matter.

1. You should limit the scope of the demonstration, so that it covers only one subject, can be covered well and is not so long as to lose the attention of the audience.

2. If the demonstration is part of a series of demonstrations necessary to convey a complete idea, try to include a minimum of material connecting it to succeeding demonstrations.

3. Be sure you have all the materials and implements necessary to do the demonstration. Do not rely on people to bring a necessary implement or material when they come to the demonstration. Have it ready beforehand.

4. Will the villager have all the tools and materials necessary to implement what you have demonstrated? If not, can you help to obtain them?

5. Be sure you can handle the tools necessary for the demonstration sufficiently well to be credible.

6. How much work is needed to adequately demonstrate the process?

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* From CHP/Guatemala

7. Know all technical terms necessary for the demonstration.

8. If the demonstration is new to you, do it by yourself once to be sure of steps, problems, etc.

9. Think about ways to reinforce learning (i.e., will it be necessary to work with each person who attended the demonstration on an individual basis? A repeat demonstration?

10. Think of ways to get people to come (for example, send word with school children, individual home visits, community notice).

11. You may want to keep a list of persons who attended the demonstration to help you remember who will need a follow-up visit and, if you are giving a series of demonstrations, to know who missed which demonstration.

Visual Aids

Visual aids can play an important part in a demonstration. A visual aid need not be a drawing. It can be a model, a finished product, a picture or a photo. Any visual aid used should be an integral part of the demonstration and not something which will be distracting in itself. The following are some questions to be considered when developing visual aids for a demonstration (since the meaning of "visual aids" may differ from what you intend or to what villagers understand in their culture):

1. Does the demonstration require visual aids?
2. Can something else be used more effectively?
3. Do the aids need to be drawn?
4. Should they be drawn before or during the demonstration?
5. Is the audience acquainted with visual aids?
6. Is it simple enough to be understood?
7. Are you sure your picture conveys the message you intend in a cross-cultural situation?

Demonstration

If the demonstration has been carefully planned, the actual demonstration should go well.

1. Begin with a simple introduction, thanking the people for coming, particularly any community leader(s) present.

2. You may want to start the demonstration by getting the audience into a directed discussion which will lead to the realization of the need for or usefulness of that project, method or process which you are about to demonstrate. Or, if the underlying need or purpose is understood, a simple statement of the object of the demonstration should be given.

3. Explain preliminary layout of materials, tools, etc.
4. Work through steps according to your plan, explaining each step as you go. This is particularly important when the steps have a specific order.
5. Have visual aids at hand so there will be no interruption while going to get them or taking the audience to a room to use the blackboard.
6. Ask if there are any questions after each step.
7. When you are finished, summarize the procedure.
8. Offer to help those willing to try what you have demonstrated. Set a specific date for individual help if the person shows sufficient interest.
9. Thank the people again for attending the demonstration.

A good demonstration consists of a well-defined purpose and a well-thought-out plan, taking into consideration the audience needs, interests, abilities and age. Careful use of visual aids can make the conveying of an idea much easier and clearer and a good plan makes things run more smoothly.

PHASE VI: CONCLUDING THE PROGRAM: THE ENERGY FAIR

The Energy Fair

The Role of the Volunteer in Development

Training Program Evaluation

	DAY 1	DAY 2	DAY 3
A.M.	SESSION 1: Orientation to Final Assessment and Evaluation (Skill Areas II & V) SESSION 2: Preparation for the Energy Fair (I & IV)	Preparation (continued)	Preparation (continued)
P.M.	Preparation (continued)	Preparation (continued)	Preparation (continued)

	DAY 4	DAY 5	DAY 6
A.M.	SESSION 3: The Energy Fair (IV)	Clean-up SESSION 5: Energy Fair Evaluation (V)	Final Preparations for Departure
P.M.	SESSION 4: Final Clean-up and Project Disassembly (IV)	SESSION 6 Training Program Evaluation (V) SESSION 7: Resources (III)	

ORIENTATION TO FINAL ASSESSMENT AND EVALUATION

Total time: 2 hours

Objectives:

* To discuss and clarify the final assessment and evaluation process

* To develop a written, cumulative self-assessment/evaluation

* To discuss and develop a final written recommendation regarding invitations to continue Peace Corps service

Resources:

* Attachment VI-1-A, "Final Assessment Worksheet"

* Attachment VI-1-B, "Final Assessment Implementation Plan"

* Copies of the five "Trainer Evaluation Forms" and"Self-Evaluation Sheets" used during the counterpart sessions throughout the training program

Procedures: Step 1. (5 minutes)
Begin by reviewing the objectives and explaining the goals of the final assessment/evaluation process.

Trainer Notes

The goal of the final assessment/evaluation process is to produce a written, final recommendation which will provide both participant and Peace Corps with a cumulative assessment of skill levels as well as a mutually-negotiated decision regarding suitability to continue with in-country training.

Step 2. (10 minutes)
Distribute and explain Attachment VI-1-A, "Final Assessment Worksheet," and Attachment VI-1-B, "Final Assessment Implementation Plan." Allow time for discussion and questions.

Trainer Notes

An individual worksheet should be provided for each of the four major skill areas to be evaluated (communication skills, commitment to program, technical skills and cognitive skills).

Step 3. (10 minutes)
Provide a brief explanation of the time-line of the final assessment process.

Trainer Notes

Due to the nature of the final phase of the training program, the time-line for carrying out the final assessment process should remain flexible and responsive to the needs of both participants and staff as dictated by commitments arising from preparation for the Energy Fair. You may find it helpful, however, to suggest that all final interviews be completed no later than the fourth day of the final phase. This will allow ample time for processing final recommendations prior to the departure of the participants.

Step 4. (5 minutes)
Give each participant a copy of each of the five past "Trainer Evaluation Forms" and "Self-Evaluation Sheets" explaining that they should be used as reference aids in writing the cumulative, self-assessment/evaluation.

Trainer Notes

In completing the worksheets, you may wish to ask participants to focus on providing succinct, cumulative statements of their self-assessments and to identify specific skill areas that they would like to continue to develop during training.

Step 5. (85 minutes)
Have the participants complete their written, cumulative statements.

Step 6. (5 minutes)
Collect the completed worksheets and all copies of the "Trainer Evaluation Forms" and "Self-Evaluation Sheets."

Trainer Notes

In keeping with the Final Assessment Implementation Plan (See Attachment VI-1-B), worksheets, "Trainer Evaluation Forms" and "Self-Evaluation Sheets" should be made available to the training staff for the purpose of developing the cumulative assessment of each participant.

Based on these two written perspectives (participant and training staff), the final interview should be a dialogue between participant and staff in which final, cumulative assessment statements and the resultant recommendations for invitation to Peace Corps service are negotiated mutually and entered in writing in the column of the worksheets.

Continued

Trainer Notes

These final, cumulative statements should be typed according to the format provided below and distributed to participants for signing.

Copies of the final recommendations should be made available to participants, the training institute and to appropriate Peace Corps authorities.

Following is a suggested format for the final written evaluations/recommendations:

FINAL EVALUATION/RECOMMENDATION

(Participant Data)	(Training Institute Data)
Name: ____________________	Name: ____________________
Program #: ________________	Address: __________________

I. SKILL AREAS

A. Communication Skills
(Cumulative statement from "Final Assessment Worksheet")

B. Commitment to Program
(Cumulative statement from "Final Assessment Worksheet")

C. Technical Skills
(Cumulative statement from "Final Assessment Worksheet")

D. Cognitive Skills
(Cumulative statement from "Final Assessment Worksheet")

II. FINAL RECOMMENDATION

In view of the above evaluation, the (name of training institute) and (name of participant) mutually recommend that an invitation to further in-country training should/should not be extended at this time.

Signature of
Participant: ______________________ Date: ____________________

FINAL ASSESSMENT WORKSHEET

Name: Program #:

- For the major skill area listed below, provide a cumulative assessment of skill level.
- Include reference to any specific skill areas upon which further training should focus.
- Provide a final recommendation regarding continued Peace Corps service.

Skill Area	Participant Cumulative Assessment	Training Staff Cumulative Assessment	Final Cumulative Statement
Final Recommendation			

ATTACHMENT VI-1-A - Page 1

FINAL ASSESSMENT IMPLEMENTATION PLAN

I. In writing, on "Final Assessment Worksheets" --

    A. Participants develop a self-assessment of their skill levels in each of the four major skill areas, based on their comments on the "Self-Evaluation Sheets."

    B. The training staff develops a similar assessment, based on their comments on the "Trainer Evaluation Forms."

II. During final interviews --

    A. Participants and training staff discuss their respective assessment statements on the worksheets.

    B. Participants and training staff negotiate final, mutually-acceptable, written statements which:

        1. Represent a summary of participant's skill levels in each of the four major skill areas

        2. Identify any specific skill areas which the participant may need additional opportunity to develop

        3. Provide a statement of final recommendation regarding the participant's suitability to continue Peace Corps service.

III. Final, cumulative statements are typed according to a "Final Evaluation/Recommendation" format and distributed to participants for signing.

IV. Copies of the "Final Evaluations/Recommendations" are made available to participants, the training staff, Peace Corps in-country representatives and Peace Corps Washington representatives.

PREPARATION FOR THE ENERGY FAIR

Total time:	22 hours
Objective:	To plan and prepare the presentation of a community festival
Resources:	As determined by the participants
Materials:	As determined by the participants
Procedures:	As determined by the participants

Trainer Notes

In keeping with the overall goal of providing participants with the opportunity to creatively demonstrate and practice skills acquired during the training program, you should encourage them to work as independently of the training staff as possible in all aspects of planning and coordinating the Energy Fair activities.

The training staff should be available for the purpose of providing consultation and guidance only.

THE ENERGY FAIR

Total time: 4 - 6 hours

Objectives:

- To present a community festival
- To demonstrate communication, cognitive and technical skills acquired during the training program

Resources: As determined by the participants

Materials: As determined by the participants

Procedures: As determined by the participants

Trainer Notes

In keeping with the overall goal of providing participants with the opportunity to creatively demonstrate and practice skills acquired during the training program, you should encourage them to work as independently of the training staff as possible in all aspects of implementing Energy Fair activities.

The training staff should be available for the purposes of providing consultation and guidance only.

If videotape equipment is available, you should arrange to record the Energy Fair activities for the purpose of providing a basis for up-coming Energy Fair evaluation (See Phase VI: Session 5).

FINAL CLEAN-UP AND PROJECT DISASSEMBLY

Total time: 4 hours

Objectives:
- * To clean and organize the training site
- * To disassemble and/or store devices built during the training program

Resources: As needed

Materials: As needed

Procedures: As needed

Trainer Notes

* Following the Energy Fair, it is expected that there will be a need for cleaning up the training site, dismantling or storing devices and removing any additional equipment built for use in the Fair.

* The procedures for this activity will depend upon the nature of the Energy Fair and, therefore, should be determined by the participants.

* One or two members of the training staff should be available to provide assistance.

ENERGY FAIR EVALUATION

Total time: 2 hours

Objectives:

- To evaluate the planning and implementing of the Energy Fair
- To plan, carry out and evaluate a training session

Materials: Newsprint and felt-tip pens

Trainer Notes

You may wish to select a participant to facilitate this session. If so, be certain to brief the participant in advance. Also, allow time at the end of the session for feedback on the participant's facilitation skills.

Procedures: Step 1. (5 minutes)
Review the session objectives and procedures.

Trainer Notes

This session is designed to carry out two processes at the same time: the participants themselves will be called upon to determine the procedure and will be practicing the skills involved in session planning while simultaneously evaluating the Energy Fair.

Step 2. (10 minutes)
Have the participants brainstorm a list of 4 or 5 criteria for evaluating their work in planning and implementing the Energy Fair. Post their responses on newsprint.

Trainer Notes

- This step should be kept as brief as possible since the criteria are meant to serve only as a basis for generating discussion.
- Provide some focus by suggesting such broad areas for evaluation as the effectiveness of planning, group work, facilitation skills, demonstrations, etc.

Step 3. (10 minutes)
Assist the participants in identifying a procedure for evaluating the Energy Fair using the criteria they have established.

Trainer Notes

- * Assist the participants by suggesting the importance of outlining the procedure in a step-by-step manner and setting time limits based on the time allotted for Step 4.
- * If a video recording of the Energy Fair has been made, suggest including it in the evaluation procedure.

Step 4. (90 minutes)
Have the participants carry out the planned procedures.

Step 5. (5 minutes)
Conclude the session by soliciting feedback from the participants regarding how well the objectives were met.

Trainer Notes

The focus of this feedback should be on the group's effectiveness at evaluating the Energy Fair as well as on their effectiveness at planning and implementing this session.

TRAINING PROGRAM EVALUATION

Total time: 2 hours

Objectives:
- To evaluate, both verbally and in writing, the overall effectiveness of the training program
- To plan, carry out and evaluate a training session

Resources: Attachment VI-6-A, "Mid-Cycle and Final Evaluation of Training Goals"

Materials: Newsprint and felt-tip pens

Trainer Notes

> Ask a participant volunteer to facilitate this session. Be certain to brief him/her thoroughly in advance and allow time at the end of the session for feedback on the facilitation skills demonstrated.

Step 1. (5 minutes)
Review the session objectives and explain that the purpose of this evaluation is to provide feedback on the training program which will be used in planning future training programs.

Trainer Notes

> This session is designed to carry out two processes at the same time: the participants will be called upon to determine the procedures and will be practicing skills involved in session planning while simultaneously evaluating the training program.

Step 2. (10 minutes)
Distribute and briefly explain Attachment VI-6-A, "Mid-Cycle and Final Evaluation of the Training Goals."

Trainer Notes

> Explain that the evaluation form is intended only as a guide in helping participants develop their own plan for evaluating the training program.

Step 3. (15 minutes)
Assist participants in planning a procedure for evaluating both verbally and in writing the overall effectiveness of the program.

Trainer Notes

Mention the importance of outlining the procedure in a step-by-step manner and setting time limits based on the time allotted for Step 4.

Step 4. (80 minutes)
Have the participants carry out the planned procedures.

Step 5. (10 minutes)
Collect the written evaluations and conclude the session, soliciting feedback regarding how well the objectives were met.

Trainer Notes

This feedback should focus on the group's effectiveness at evaluating the program as well as on the group's effectiveness at planning and implementing the session.

MID-CYCLE AND FINAL EVALUATION OF TRAINING GOALS

Rate the effectiveness of the training program in achieving the following goals. Give 2 or 3 specific examples in support of your rating.

	Not very Effective		Adequate		Extremely Effective
1. Assess and analyze community felt needs	1	2	3	4	5
2. Assist others in the design, adaptation, construction, utilization and maintenance of simple technologies	1	2	3	4	5
3. Acquire and apply skills and attitudes that promote the improvement of the quality of life through local initiative, community problem solving	1	2	3	4	5
4. Examine and understand the cultural and societal values that accompany all overseas development workers	1	2	3	4	5
5. Develop and practice effective experiential learning and teaching processes	1	2	3	4	5
6. Understand the synergistic relationship between health and technology and the interrelated nature of all aspects of culture	1	2	3	4	5
7. Encourage and include the active, full participation of all community members in programs of change	1	2	3	4	5
8. Maintain personal well-being and the attitudes conducive to effective and appropriate overseas service	1	2	3	4	5

RESOURCES

Total time: 1-1/2 hours

Objective: To identify and discuss resources available to assist field workers in developing countries

Resources:

- * Attachment VI-7-A, "Appropriate Technology Information and Resource List"
- * Bibliography, from Training Manual

Materials: Paper and pens

Procedures: Step 1. (10 minutes)
Review the session objectives and distribute Attachment VI-7-A, "Appropriate Technology Information and Resource List," and the Bibliography from Appendix C.

Trainer Notes

While distributing the materials, explain that an important role of community development facilitators is to promote the exchange and development of resource information.

Step 2. (30 minutes)
Facilitate a discussion of some of the various resources available to Peace Corps Volunteers and of appropriate ways to use them.

Trainer Notes

Some suggested topics for this discussion include:

Host country resources:

- * Government agencies, offices and ministries
- * Libraries
- * Embassies (for literature and films)
- * Other voluntary agencies and assistance groups
- * Other PCVs and staff
- * Development agencies (UNDP, USAID)

Peace Corps, Washington:

- * Information Collection and Exchange (ICE)
- * ACTION library
- * Desk officers

Continued

Trainer Notes/Continued

Organizations that provide technical assistance, including:

* Volunteers in Technical Assistance
* Intermediate Technology Development Group
* League for International Food Education

Films and periodicals:

* See resource lists.

Health and nutrition information:

* See resource lists.

Women in development information:

* See resource lists.

Funding:

* Peace Corps Partnership Program
* US AID
* Local resources
* Private voluntary organizations
* VITA
* Appropriate Technology International
* International development groups and appropriate technology organizations
* Review of proposal writing

Networking:

* Development and appropriate technology organizations
* Newsletters and journals
* Establishment and maintenance of a Peace Corps Energy Program network

Step 3. (25 minutes)
Encourage participants to contribute additional resource information and exchange any addresses which may be mutually beneficial.

Step 4. (15 minutes)
Conclude the session by encouraging a brief discussion of ways in which participants can provide one another with informational support while in the field.

Trainer Notes

Suggest newsletters, correspondence, tapes, etc. and emphasize the importance of forming and joining a network of development facilitators who share similar goals.

APPROPRIATE TECHNOLOGY INFORMATION AND RESOURCE LIST

Information Collection & Exchange
Office of Multilateral and Special Programs
ACTION/Peace Corps
806 Connecticut Ave. N. W.
Washington, D. C. 20525
(for program and training journals, and appropriate technology information)

Farallones Institute Rural Center
15290 Coleman Valley Road
Occidental, CA 95465

Farallones Institute Urban House
1516 5th Street
Berkeley, CA 94710
(plans, drawings, publications, info)

Aprovecho Institute
359 Polk Street
Eugene, OR 97402
503-929-6925

Community Environmental Council
924 Anacapa St., Suite B4
Santa Barbara, CA 93101
(drawings, publications, info)

Institute for Local Self-Reliance
1717 18th St. N. W.
Washington, D.C. 20009
(charts, drawings, publications, info)

State of California Office of Appropriate Technology
1623 10th St.
Sacramento, CA 95814
916-445-1803

New Alchemy Institute
Box 432
Woods Hole, MA 02543
(info and monthly journal)

Appropriate Technology International
1709 N St. N. W.
Washington, D.C. 20036
202-293-9270
(funding & info for 3rd world groups)

Hesperian Foundation
P. O. Box 1692
Palo Alto, CA 94302
415-327-4576
(health & self-help info)

INFORMATION WITH PUBLICATIONS

Newsletters and books

Volunteers in Technical Assistance
3706 Rhode Island Ave.
Mt. Rainier, MD 20822
(monthly newsletter, technical assistance service & Vita Village Technology Handbook in Spanish and English)

Appropriate Technology Project
Volunteers in Asia
Box 4543
Stanford, CA 94305
(excellent Appropriate Technology Sourcebook to get you to what you are looking for)

Intermediate Technology Development Group
9 King St.
London WCQE 8HN
England
(quarterly Journal of Appropriate Technology - if you only have one to subscribe to, this is it! and publications list on everything you can imagine)

International Association for the Advancement of Appropriate Technologies for Developing Countries
University of Michigan
603 East Madison
Ann Arbor, MI 48109
313-764-6410
(monthly journal called Approtech)

Continued

Transnational Network for Appropriate
Technologies (TRANET)
P. O. Box 567
Rangeley, ME 04970
(excellent networking and ideas-oriented newsletter)

Vecinos Mundiales/World Neighbors
5116 North Porland Avenue
Oklahoma City, OK 73112
(quarterly magazine in both Spanish & English; excellent for material on work you might do in community development)

Brace Research Institute
McDonald College of McGill University
Ste. Anne de Bellevue, P. Q.
HOA ICO Canada
(lots of technical information)

Canadian Hunger Foundation
75 Sparks St.
Ottawa, Ontario
KIP 5A5 Canada
(last two groups have jointly published A Handbook in Appropriate Technology)

Technical Assistance Information Clearinghouse
(TAICH)
200 Park Ave. South
New York, NW 10002
(newsletter on world issues)

Whole Earth Truck Store
558 Santa Cruz Ave.
Menlo Park, CA 94025
(bibliography list & mail order of anything, almost!)

APPENDIX A:

SKILLS FOR DEVELOPMENT FACILITATORS

SKILLS FOR DEVELOPMENT FACILITATORS

I. Taking Preparatory Steps

In the preliminary stage of collaboration with a community or other group of people, the facilitator should:

A. Understand and be able to articulate his or her:

1. Motivation
2. Expectations of the experience
3. Strengths and weaknesses
4. Role as a facilitator
5. Individual values

B. Be sensitive to and able to identify:

1. Expectations of the local community or other group
2. Local culture and resources, including customs, values, knowledge and ways of life

C. Communicate in ways that demonstrate:

1. Active listening and observation skills
2. An ability to filter information
3. Skill in working cooperatively and in collaboration with others
4. An understanding of the participatory approach to development
5. An ability to synthesize and articulate information in ways that promote local self-reliance, integrity and well-being

D. Utilize appropriate on-going techniques for evaluating the preliminary stages of involvement

II. Establishing a Dialogue

In the next stage of involvement, the facilitator should:

A. Demonstrate skills in facilitation and organization that include:

1. An ability to work with existing local social structures and groups
2. Stimulating active local participation
3. Motivating others to contribute their skills and knowledge
4. Planning and facilitating meetings, when appropriate
5. Sharing techniques for effective problem solving, team building and negotiating

B. Be able to examine, analyze and prioritize issues, concerns and needs within the local context

II. C. Understand and be able to articulate development issues in relation to local problems and strategies for change

D. Continue to develop skills in interpersonal communication, including:

1. Encouragement of local leadership, when appropriate
2. Building trust and confidence
3. Consultation (e.g., active listening, conferring and feedback)

E. Use on-going and appropriate techniques to evaluate the use of dialogue in community work

III. Planning with the Community

In planning for active community participation, the facilitator should:

A. Collaborate with the local cummunity or group to identify:

1. Needs
2. Resources
3. Goals and objectives
4. Potential problems or limiting factors

B. Assist in the establishment of:

1. Project criteria
2. Plan of action
3. Methods of project documentation
4. Relationships with appropriate organizations and agencies to form a supportive network

C. Articulate the manner and extent of his or her involvement of the development process

D. Use on-going evaluation methods to review the planning stage

IV. Using the Dialogue Approach

Throughout the stages of community involvement, the facilitator should:

A. Demonstrate an understanding of non-formal education through the use of:

1. A variety of communication techniques
2. Problem-solving activities
3. Methods that motivate others to actively participate in the education process

IV. B. Stimulate project implementation through the use of local skills, knowledge and resources during:

1. Development and/or construction
2. Adaptation and modification
3. Utilization
4. Project review

C. Use on-going methods of evaluation to ensure that project implementation is consistent with the participatory approach to development

V. Evaluating the Process

In order to learn from, and improve upon the experience of working with a community or other group, the facilitator should:

A. Collaborate in the establishment and use of appropriate evaluation criteria and techniques.

B. Use a continuing process of evaluation to:

1. Review the level of local participation
2. Review methods and approaches used during development work
3. Assess the level of local self-reliance and well-being
4. Analyze each phase of development work
5. Generalize and apply the knowledge gained to improve the participatory approach to development

APPENDIX B:

TWO-WEEK WORKSHOPS

Two-Week Workshops:

EARTHEN CONSTRUCTION AND FUEL-SAVING COOKSTOVES

PEDAL/TREADLE POWER

SOLAR WATER HEATERS

SOLAR AGRICULTURAL DRYERS

The following calendar pages represent a suggested format for converting each of the four technical phases of this program into independent two-week workshops. In addition to technical sessions, each workshop contains selected core sessions related to training methodology, the role of the volunteer in development, health and nutrition, independent study, appropriate aids to communication and evaluation.

In designing each workshop, overseas trainers should consider the following recommended guidelines:

* Review the entire manual carefully and choose core sessions which meet country-specific needs.

* Wherever necessary, modify individual session procedures to account for the two-week format.

* As a basic reference in carrying out all suggested group dynamics activities, refer to Phase I: Session 12, "Construction of Earthen Block Molds - A Focus on Group Dynamics."

* Review Phase I: Session 4, "Appropriate Educational and Learning Processes," and Phase I: Session 5, "Development of Facilitation Skills Criteria," and modify the procedures for both sessions so the objectives can be met in a four-hour time period.

EARTHEN CONSTRUCTION AND FUEL-SAVING COOKSTOVES (Week One)

	DAY 1	DAY 2	DAY 3
A.M.	Sharing Perceptions of Appropriate Technology: An Ice Breaker/ Phase I: Session 1	Global Energy Issues/ Phase I: Session 14	Traditional Methods of Cooking: An Introduction to Cookstove Technologies/ Phase II: Session 2
	Defining Expectations of the Community Technology Training Program/ Phase I: Session 2	Construction of Earthen Block Molds - A Focus on Group Dynamics/ Phase I: Session 12	Fuel-Saving Cookstoves: Gathering Information/ Phase II: Session 3
P.M.	Group Resource Assessment/ Phase I: Session 3		Cookstove Design and Innovation/ Phase II: Session 4
	Hollow Square/ Phase I: Session 7	Construction of Earthen Blocks/ Phase I: Session 13	Introduction to Independent Study/ Phase II: Session 6

	DAY 4	DAY 5	DAY 6
A.M.	Appropriate Educational and Learning Processes, Parts 1 and/or 2 (Option)/ Phase I: Session 4	Cookstove Operation, Function and Design Principles/ Phase II: Session 7	Cookstove Construction (continued)/ Phase II: Session 10
	Development of Facilitation Skills Criteria (option)/ Phase I: Session 5	Understanding the Cookstove Design Process and Soil Mixes/ Phase II: Session 8	
P.M.	Environmental Health and Sanitation/ Phase II: Session 1	Cookstove Construction, Parts 1, 2 and 3/ Phase II: Session 10	
	The Role of the Volunteer in Development: The Definition of Appropriate Technology/ Phase II: Session 13		

EARTHEN CONSTRUCTION AND FUEL-SAVING COOKSTOVES (Week Two)

	DAY 7	DAY 8	DAY 9
A.M.	Cookstove Construction (continued)/ Phase II: Session 10 Use of Appropriate Aids to Communication/ Phase III: Session 6	Volunteer in Development: Part 1: Women in Development/ Phase III: Session 19 Maternal and Child Health, Part 1/ Phase III: Session 1	Basic Nutrition/ Phase II: Session 23 Other Responses to Fuel Scarcity/ Phase II: Session 18 Charcoal Production and Stoves/ Phase II: Session 19
P.M.	Stove Promotion and Dissemination/ Phase II: Session 14 Independent Study Explaining Completed Cookstoves/ Phase II: Session 15	Evaluating Cookstove Efficiency/ Phase II: Session 16 Diagnosing and Repairing Malfunctioning Cookstoves Parts 1 and 2/ Phase II: Session 17	Design and Construction of the Second Stove, Parts 1, 2 and 3/ Phase II: Session 21
	DAY 10	DAY 11	DAY 12
A.M.	Design and Construction of the Second Stove (continued) Phase II: Session 21 Independent Study and Clean-Up Alternative Cookstoves Presentations/ Phase II: Session 22	Cookstove Operation, Parts 1 and 2/ Phase II: Session 24	Cookstove Information Resources, and Evaluating Cookstove Training/ Phase II: Session 26 Evaluation and Integration of Training Themes, Parts 1, 2 and 3/ Phase I: Session 16
P.M.	Issues and Methods in the Development and Diffusion of Appropriate Technology/ Phase V: Session 11	Cookstove Development and Innovation/ Phase II: Session 25 Appropriate Technologies for Health/ Phase III: Session 13	

PEDAL/TREADLE POWER (Week One) TWO-WEEK WORKSHOP - Page 1

	DAY 1	DAY 2	DAY 3
A.M.	Sharing Perceptions of Appropriate Technology: An Ice Breaker/ Phase I: Session 1 Defining Expectations of the Community Technology Training Program/ Phase I: Session 2	Global Energy Issues/ Phase I: Session 14 Appropriate Educational and Learning Processes, Parts 1 and/or 2 (option)/ Phase I: Session 4	The Role of the Volunteer in Development: The Definition of Appropriate Technology Phase II: Session 13 Design Considerations for Pedal/Treadle/ Phase III: Session 4
P.M.	Group Resource Assessment/ Phase I: Session 3 Hollow Square/ Phase I: Session 7	Development of Facilitation Skills Criteria (option)/ Phase I: Session 5 Introduction to Pedal/ Treadle Power/ Phase III: Session 3	Classical Mechanics: Principles of Pedal/ Treadle Power/ Phase III: Session 5 Use of Appropriate Aids to Communication/ Phase III: Session 6

	DAY 4	DAY 5	DAY 6
A.M.	Food Issues/ Phase II: Session 12 Part 1: Familiarization with Parts and Tools, Part 2: Familiarization with the Bicycle (option) Phase III: Session 8	Presentation of Designs/ Phase III: Session 10 Introduction to Independent Study/ Phase II: Session 6 Independent Study	Construction of Pedal/Treadle Devices/ Phase III: Session 11
P.M.	Introduction to Design/ Phase III: Session 9	Maternal and Child Health, Part 2/ Phase III: Session 7 Volunteer in Development: Part 1: Women in Development/ Phase III: Session 19	

PEDAL/TREADLE POWER (Week Two) TWO-WEEK WORKSHOP - Page 2

	DAY 7	DAY 8	DAY 9
A.M.	Construction of Pedal/ Treadle Devices (continued)/ Phase III: Session 11	Construction of Pedal/ Treadle Devices (continued)/ Phase III: Session 11	Construction of Pedal/ Treadle Devices (continued)/ Phase III: Session 11
P.M.	Basic Nutrition/ Phase II: Session 23	Issues and Methods in the Development and Diffusion of Appropriate Technology Phase V: Session 11	Wind Technology/ Phase IV: Session 12

	DAY 10	DAY 11	DAY 12
A.M.	Blacksmithing and Metalwork/ Phase III: Session 12 Construction of Pedal/ Treadle Devices (continued)/ Phase III: Session 11	Case Studies in Community Health/ Phase III: Session 14 Independent Study	Independent Study and Clean-Up Evaluation and Integration of Training Themes, Parts 1, 2 and 3/ Phase I: Session 16
P.M.	Preparation for Pedal/ Treadle Presentations/ Phase III: Session 15	Presentation of Pedal/ Treadle-Powered Devices/ Phase III: Session 18	

SOLAR WATER HEATERS (Week One) TWO-WEEK WORKSHOP - Page 1

	DAY 1	DAY 2	DAY 3
A.M.	Sharing Perceptions in Appropriate Technology: An Ice Breaker/ Phase I: Session 1	Introduction to Solar Water Heaters/ Phase IV: Session 2	Appropriate Educational and Learning Processes, Parts 1 and/or 2 (option)/ Phase I: Session 4
	Defining Expectations of Community Technology Training Program/ Phase I: Session 2	Assessing Community Water Needs and Uses/ Phase IV: Session 3	Development of Facilitation Skills Criteria (option)/ Phase I: Session 5
P.M.	Group Resource Assessment/ Phase I: Session 3		Introduction to Solar Water Heating: Determining Hot Water Demand/ Phase IV: Session 4
	Hollow Square/ Phase I: Session 7	Global Energy Issues/ Phase I: Session 14	Environmental Health and Sanitation/ Phase II: Session 1

	DAY 4	DAY 5	DAY 6
A.M.	Plumbing a Solar Water Heater/ Phase IV: Session 5	The Role of the Volunteer in Development: The Definition of Appropriate Technology/ Phase II: Session 13	Use of Appropriate Aids to Communication/ Phase III: Session 6
	Sizing a Solar Water Heater/ Phase IV: Session 6	Insolation Meter Construction/ Phase II: Session 9	Demonstration of a Technical Concept/ Phase IV: Session 7
P.M.	Appropriate Technologies for Health/ Phase III: Session 13	The Path of the Sun/ Phase III: Session 2	
	Introduction to Independent Study/ Phase II: Session 6	Case Studies in Community Health/ Phase III: Session 14	

	DAY 7	DAY 8	DAY 9
A.M.	Heat Transfer/ Phase III: Session 16 Shade Mapping and Solar Siting/ Phase IV: Session 8	Construction of Solar Water Heaters/ Phase IV: Session 10	Volunteer in Development: Part 1: Women in Development/ Phase III: Session 19 Construction of Solar Water Heaters (continued) / Phase IV: Session 10
P.M.	Design of Solar Water Heaters/ Phase IV: Session 9		

	DAY 10	DAY 11	DAY 12
A.M.	Issues and Methods in the Development and Diffusion of Appropriate Technology/ Phase V: Session 11	Construction of Solar Water Heaters (continued)/ Phase IV: Session 10 Independent Study	Independent Study and Clean-Up Evaluation and Integration of Training Themes, Parts 1, 2 and 3/ Phase I: Session 16
P.M.	Construction of Solar Water Heaters (continued) / Phase IV: Session 10	Presentation of Solar Water Heaters/ Phase IV: Session 15	

SOLAR AGRICULTURAL DRYERS (Week One) TWO-WEEK WORKSHOP - Page 1

	DAY 1	DAY 2	DAY 3
A.M.	Sharing Perceptions of Appropriate Technology: An Ice Breaker/ Phase I: Session 1 Defining Expectations of Community Technology Training Program/ Phase I: Session 2	Introduction to Agricultural Dryers/ Phase V: Session 1 Tour of Solar Dryers/ Phase V: Session 2	Global Energy Issues/ Phase I: Session 14 Solar Agricultural Dryer Procedures and Rules of Thumb/ Phase V: Session 3
P.M.	Group Resource Assessment/ Phase I: Session 3 Hollow Square/ Phase I: Session 7	Appropriate Educational and Learning Processes, Parts 1 and/or 2 (option)/ Phase I: Session 4 Development of Facilitation Skills Criteria/ Phase I: Session 5	Two-Hour Dryer Construction/ Phase V: Session 4 Review of Existing Solar Dryer Plans/ Phase V: Session 5
	DAY 4	**DAY 5**	**DAY 6**
A.M.	Maternal and Child Health, Part 1/ Phase III: Session 1 Insolation Meter Construction/ Phase II: Session 9	Smoke Testing Solar Dryers/ Phase V: Session 6 New Technologies: Introducing Solar Dryers/ Phase V: Session 7 Design of Solar Agricultural Dryers/ Phase V: Session 8	The Role of the Volunteer in Development: The Definition of Appropriate Technology Phase II: Session 13 Introduction to Independent Study/ Phase II: Session 6
P.M.	The Path of the Sun/ Phase III: Session 2 Heat Transfer/ Phase III: Session 16		

	DAY 7	DAY 8	DAY 9
A.M.	Site Selection and Preparation/ Phase V: Session 9 Construction of Solar Agricultural Dryers/ Phase V: Session 10	Basic Nutrition/ Phase II: Session 23 Construction of Solar Agricultural Dryers (continued)/ Phase V: Session 10	Volunteer in Development: Part 1, Women in Development/ Phase III: Session 19 Construction of Solar Agricultural Dryers (continued)/ Phase V: Session 10
P.M.			Practical Drying Tips/ Phase V: Session 15 Independent Study

	DAY 10	DAY 11	DAY 12
A.M.	Nutritional Gardening/ Phase V: Session 14	Issues and Methods in the Development and Diffusion of Appropriate Technology/ Phase V: Session 11	Presentation of Solar Dryers/ Phase V: Session 19 Evaluation and Integration of Training Themes, Parts 1, 2 and 3/ Phase I: Session 16
P.M.	Dryer Assessment and Modification/ Phase V: Session 17	Introduction to Cost Benefit Analysis/ Phase V: Session 18 Use of Appropriate Aids to Communication/ Phase III: Session 6 Independent Study	

APPENDIX C: BIBLIOGRAPHIES

KEY

** Distribute to Trainees.
Denotes texts that should be purchased in sufficient quantities for distribution to all trainees.

* Necessary for Trainers.
Indicates essential resources that should be on hand as reference for trainers and/or for photocopying of selected parts for distribution to participants.

No asterisk indicates those publications which are recommended but not essential to carry out the program.

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** Distributed to Trainees
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